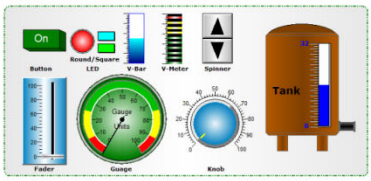
InstantHMI 6.1

IHMI/SCADA Software for Windows PC, Windows CE, PDA and Smartphones

'Cloud Ready' for Remote Access from any Browser
(iPad, iPhone, Android, BlackBerry, Laptop PC, etc.)

InstantHMI - HMI/SCADA Software
for Windows PC, CE/XPE, PDA and Smartphones



Enhanced Widgets
Buttons, LEDs, Gauge, Knob, Active Box, Active Circle etc.

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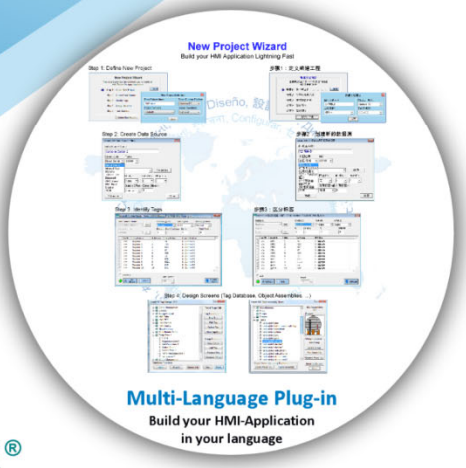

Multi-Language Plug-in
Build your HMI-Application
in your language

GoToMyHMI
Your HMI-Gateway.™ in the Cloud

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Welcome to InstantHMI® 6.1

Enjoy all the benefits of a traditional HMI on Windows PC, CE and Mobile. InstantHMI 6.x is 'Cloud Ready' so you can also benefit from Cloud Computing. Use **GoToMyHMI:** our 'HMI-Gateway in the Cloud' from any Browser on any device (iPad, iPhone, Android, BlackBerry, Laptop PC, etc.) to access your HMI-Server (InstantHMI 6.x Runtime installed on Windows PC or Windows CE touch panels). GoToMyHMI (for Windows 8) has received '**Top App Award'** from Microsoft.

Highlights of InstantHMI

- 'Design Once, Deploy Anywhere' platform scalable new generation HMI Technology for Windows PC, Windows CE (touch panels), PDA (Pocket PC and Windows Mobile) and Smart Phone Platforms.
- All the powerful and convenient features that you expect in a standard PC-based HMI-technology: Monitoring, Data Logging, Real Time & Historic Trending, Alarm Management, Reporting, Control, etc.
- The Windows PC based LaunchPad Development System is used to design Project screens and Tag database to be deployed on any of the target platforms with InstantHMI Runtime engine. The LaunchPad allows pre-testing of the tags and screens on the Windows PC platform *before* deploying on the target PC, CE or PDA platform.
- InstantHMI 6.1 provides 'Anytime, Anywhere' connectivity to process and machine control information.
- Ease of 'language localization' brings our multi-platform HMI solution, to any Unicode supported language.

Why Upgrade to InstantHMI 6.1: Users of earlier versions of InstantHMI can transfer their project (Tag databases, screens, etc.) easily to InstantHMI 6.1 framework and benefit from the new functionality (see selected list below).

Selected Feature Benefits of InstantHMI:

- The screen data object *display format* is independent of the *raw data* of the tag object in the Tag Database. You can view data from a data source in different formats on one or more screens.
- Enhanced Data Table Viewer in Screen Designer to monitor/modify tags and transfer to the Tag Database (5.0.9).
- Real Time and Historic Trend Plots on PDA as well as PC, Alarm Logging Object , enhanced Tanks, Scales, Gauges, Faders, Knobs, and other widgets, Print Screen feature for 'Instant Runtime Status Dump' (4.1)
- Project Protection to prevent screen/tag modifications and provide intellectual property protection for OEMs (4.1)
- Scripting tool is enhanced. You may use any (long) variable names for local and global variables (4.2, 5.0).
- OLE, COM, ActiveX component support enhanced with improved user interface and functionality (4.2, 5.0)
- Use dynamic runtime association of Object Assemblies with multiple Tag Groups for streamlined monitoring of similar sub-systems (5.0.5 - 5.0.9). Object Assembly with assignable tags (5.1) and copies with assigned tag groups (6.1.29).
- Use Watch Lists in Runtime to monitor/modify controller tags from different groups (5.0.5 - 5.0.8). A single watch list (in an object assembly) can provide a comprehensive, yet simple, interface to let you monitor thousands of tag variables, for dozens of controller stations in a concise and familiar manner (like browsing through the Controller user manuals).
- New Project Wizard guides you step by step to quickly create and run a new project in minutes (5.0.9).
- Enhanced Widgets (Buttons, LEDs, Gauge, Knob, Active Box, Active Circle etc.) with settable properties and testable preview (5.0.10 - 5.1.5).
- Enhanced Recipe Manager with Recipe Templates and Recipe Names for Design and Runtime ease of use (5.0.16).
- Enhanced Macro Manager with a new macro database and an enhanced Script Editor (5.1.4). These utilities are accessible directly from the LaunchPad as well as from Screen Designer.
- Enhanced Help System (F1 key most anywhere) for Design and Runtime ease of use (5.1.4).
- Image formats may be .bmp, .jpg, .gif or .png (5.1.4).
- 'Cloud Ready' for remote access from any standard browser (iPad, iPhone, BlackBerry, Laptop PC, etc.) (6.x).
- PgUp/PgDn to switch to next/previous project screens in Screen Designer (6.x).
- Text, Box, Circle, V/H Bar, V/H Meter objects with Rotation and Shading attributes (6.x).
- Attribute Tags may be assigned to objects to dynamically set 'Visibility' property for objects; this property provides the capability to design 'pop-up windows' at runtime.
- Screen Objects and entire screen may be pre-tested for communication errors in the Designer (6.1).
- InstantHMI 6.1 supports Alarm Management Features compatible with ANSI/ISA - 18.2 - 2009 standards, a Task Scheduler that eliminates need for Scripting in Reporting etc., and RTF (fonts, colors, pictures, …) in Report Templates.
- Windows Key management (Ctrl+Alt+Del, Task Bar control, etc.) implemented (6.1.20).
- Logging data into user created Excel sheets and filtering seleted columns and rows for customized reporting (6.1.20).
- Streamlined database design for Data logging with dynamic compression and archiving allows millions of records to be logged/analyzed over days and months (6.1.21).
- Mini-LaunchPad added to CE runtime platform for ease of modifying Data Source etc. after project deployment (6.1.27).
- Comm Interface re-architected for multi-core multi-threaded parallel processing of all communication channels (6.1.29).
- Tag Access Levels 1-10 allow control of user inputs; user input changes are logged for any specified tag(s) (6.1.30).
- Runtime API allows user written program to read the alarm status of tags being monitored by the Runtime (6.1.31).
- Multiple (dual) monitor support in Runtime lets users view and control multiple (two) screens simultaneously (6.1.31).
- All known and customer reported bugs have been fixed and many feature requests implemented.

We appreciate the feedback from our valued customers. With these enhancements, its 'Simpler is Better' architecture, and being 'Cloud Ready', **InstantHMI hopes to be your preferred HMI/SCADA solution on the ground and in the cloud**.

The InstantHMI 6.1 Development Team

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1 InstantHMI® for your Application

1.1 Introduction

InstantHMI® incorporates our “Design Once, Deploy Anywhere” HMI technology. This will allow you to design your HMI project on a Windows PC platform, and deploy it on any Windows PC, or Windows CE, or PDA (Windows Mobile or Pocket PC) platform, which has an installed InstantHMI Runtime engine. Install it on Windows PC platforms for a traditional single or multi-node Client/Server HMI setup. For a mobile/wireless solution install it directly on a Windows Mobile PDA or use our InstantChip™ technology to run from a CF/SD card. Use InstantPanel™, our Windows CE color touch system (5.6", 8", 10.4", 12.1" and 15.0" screens), for panel mount machine control applications. Any InstantHMI runtime engine can stand-alone or be part of a client-server network.

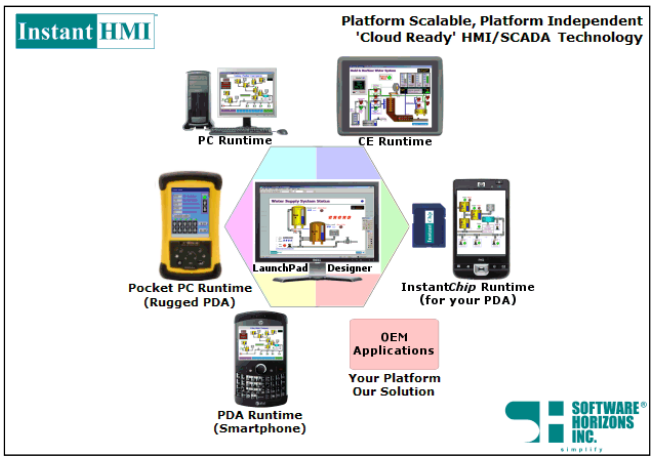


Figure 1-1: InstantHMI for Your Hardware Platform

InstantHMI 6.x is ‘**Cloud Ready**’ so you can also benefit from Cloud Computing. Use GoToMyHMI: our ‘HMI-Gateway in the Cloud’ from any Browser on any device (iPad, iPhone, Android, BlackBerry, Laptop PC, etc.) to access your HMI-Server (InstantHMI 6.x Runtime installed on Windows PC or Windows CE touch panels). See Sections 1.3, 1.4. For more information on GoToMyHMI visit www.GoToMyHMI.com and review the information and manual available there.

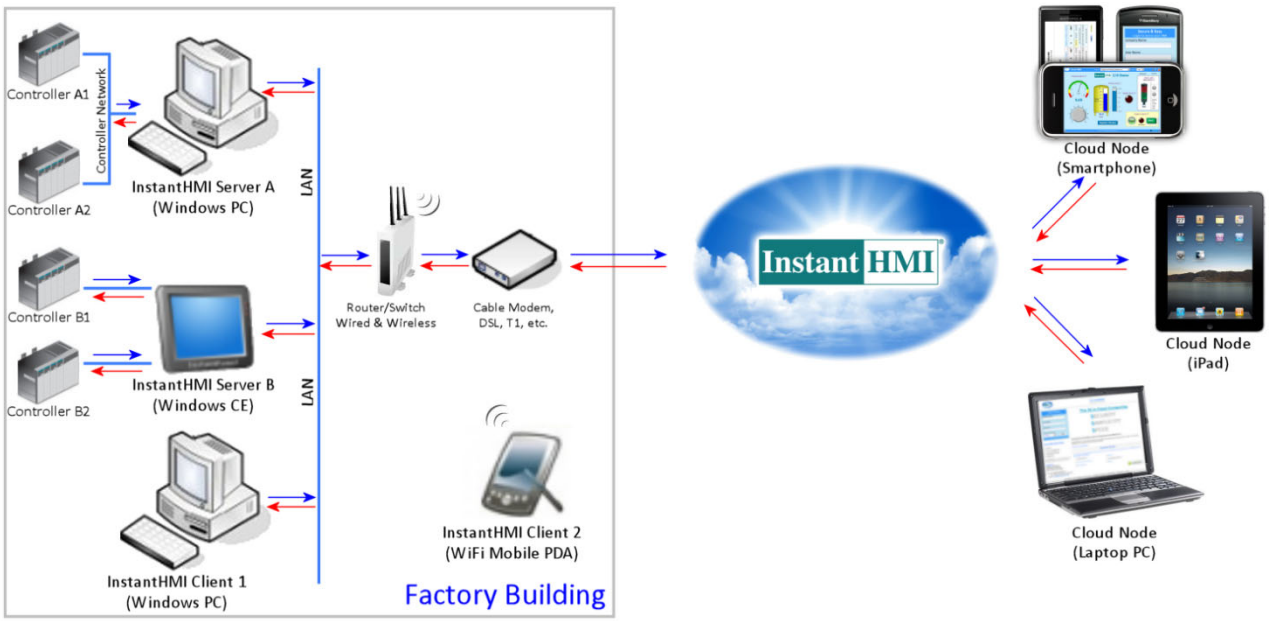


Figure 1-2: GoToMyHMI: ‘HMI-Gateway in the Cloud’ puts InstantHMI in the Cloud

This manual covers all platforms on which InstantHMI can be deployed (Windows PC, Windows CE, Windows Mobile, and Pocket PC). All figures and discussions are illustrated with any one of the platforms unless there are significant differences among the implementations for the different platforms in which case the specific platform will be identified. If a specific feature is critical for successful implementation of your project, you must verify its availability on the platform of your choice; please contact Software Horizons for assistance.

1.2 InstantHMI Design and Runtime Platforms

InstantHMI LaunchPad allows you to design your HMI project on a Windows PC platform, and deploy it on any Windows PC, Windows CE or PDA (Windows Mobile or Pocket PC) platform, which has an installed InstantHMI Runtime engine. PC-based HMI is well understood and most people are familiar with the concept. However, since 'full featured HMI' on a PDA platform is not commonly expected and is not well understood, in the rest of this section we address some salient PDA and CE platform issues. While InstantHMI Nodes (Runtime engines) on various platforms can interact with each other, **any InstantHMI node (including a PDA node) can stand alone**; that is, PDA based InstantHMI does not require a PC node (to act as a 'server').

Figure 1-3: Illustrating InstantHMI on Windows CE and PDA platforms

Why Deploy InstantHMI on a PDA? Mobility, low cost, and wireless connectivity are some of the reasons why PDA based HMI can enhance your total HMI solution. We list a few illustrative scenarios below.

Scenario 1: You are the operator responsible for running your process. Your boilers are working OK but you know you can make them work more efficiently if you could only monitor what the controller was doing. You have that wonderful PDA (Pocket PC) in your shirt pocket. Moreover, you have InstantHMI software installed in your PDA. You walk over to the controller cabinet, plug in the communication cable to the serial port on the PDA, turn on the PDA, and tap the stylus over the InstantHMI icon on the touch screen. The monitoring screen shows the Boiler Temperature and pressures for the two boilers. (If your controller has an infrared port on it, you don't even need a cable; just beam the PDA's built in IR head at the controller). Of course, InstantHMI will show any other variables that are relevant to your task at hand. You decide to look at the P-I-D parameters for the Feed Water control loop. Tap on the screen fields to change the tag names to display the P-I-D tags and the Set Points. Enter the new values (based on your analysis) through the screen and switch to monitoring and log the data in the PDA for the next ten minutes or so. Go get your cup of coffee (you earned it!), while InstantHMI is logging the data for your review.

Scenario 2: You are the operator responsible for installation and startup of a machine control system. Your task includes verifying that the Input/Output wiring for the system is as required before the machine can go into production. The machine includes an elaborate PC based HMI. Verification of the I/O tags and the corresponding system response requires two persons: one setting I/O tag values on the HMI screen and the other to observe and verify the actual system component response. But you have a mobile, wireless Pocket PC with InstantHMI installed on it. You walk over to a location where you can observe the system component(s) of interest, use the InstantHMI I/O tags to set the I/O values, and observe the actual system response. Your colleague can be doing other useful tasks during this verification period rather than act as your helper.

Scenario 3: Your process, which has been running fine for a long period of time, has started exhibiting certain unusual behavior. You have certain ideas on what may be going wrong, but you would like to collect some

additional data to confirm which of your thoughts are worth pursuing further in detail. Changes or additions to the existing, elaborate, sophisticated HMI are not feasible over the short haul. You whip out your Pocket PC based InstantHMI, collect some data for tags of interest, independent of and without disturbing the existing HMI, and use this information to solidify your ideas and present it to the group or management for further action and/or enhancement of the existing elaborate HMI.

Scenario 4: With a low price for the complete system (Pocket PC hardware, RS232 serial cable, adapter and software) now even the lowest cost “micro” PLCs and other controllers can have their own HMI.

Scenario 5: You are ‘on call’ for Alarm Management at the plant. Your company has subscribed to GoToMyHMI services and you receive an email alert to your iPhone. You glance at your email, notice a High-High Temperature Alarm, click on the link to access the Alarm Page from your HMI-Server and ACK the alarm and turn on the backup coolant pump. You saved a trip back to the factory and had a good night’s sleep.

InstantHMI runtime engine on a PDA node can '**stand alone'** as it does not require a runtime engine on a PC node to act as a 'Server'. When a runtime engine is also available on a PC or other platform nodes, the PDA based runtime can easily exchange information with the other InstantHMI runtime nodes in a 'Client-Server' setup.

Quick deployment of InstantHMI on a PDA platform is possible (without the need for elaborate Project setup) if you can take advantage of the integrated Runtime and Design screens of a traditional HMI provided in InstantHMI by the use of a tag database (organized into tag groups) and pre-formatted screens. The Scrollable Monitor screen allows the small touch screen of the PDA to be used to view Data Registers, I/O bits, Timer/Counter values etc. in conveniently named tag groups. (The Data Table function allows you to view / modify controller information even when you have not setup any tags). Parameter values such as P-I-D can be input from the PDA by touch or with the help of a stylus (Password protection is built-in). Register and other data values can be logged in the PDA and reviewed later.

InstantHMI is Screens and Buttons oriented to make it straightforward and easy to use. PLC communication protocol parameters can be easily configured. The Tag Editor allows you to add, modify or delete tags. (OEM versions come with pre-created tag database). These tags are used to monitor and /or modify data through the runtime screen. The Tag Group Manager allows you to organize tags into named groups; this is useful in functional grouping of tags (Recipes, Configuration etc.). InstantHMI allows on-demand data logging of selected tags in a database which can be reviewed on the PDA in a scrollable table or the PDA can be connected to a desktop PC at a later time to transfer the logged data for Historic Trending, Reporting or other analysis.

InstantHMI has an architecture which supports traditional HMI screens (designed and deployed using the LaunchPad Development system) on PDA platforms. This feature permits OEM and machine control applications to be built using specialized screens (see Project Protection, Section 2.4.3). If you have any special applications contact us so we may adapt InstantHMI to meet your special needs.

InstantHMI runtime installed in the PDA (Windows Mobile or Pocket PC) makes configuration, diagnostic, trouble shooting and data logging tasks for your controller equipment as simple as possible. The compact shirt pocket size of the PDA and the infrared beaming and wireless RF capability incorporated in InstantHMI, provide for the greatest mobility and make InstantHMI available **‘any time, any place’** as a human machine interface. The creation of tags may be done directly on the PDA with InstantHMI; however, this chore is made much more convenient using the LaunchPad's Screen Designer (Section 4) running on a Windows Desktop PC.

1.3 InstantHMI Runtime in Traditional HMI Scenarios

As you would expect from any standard HMI, InstantHMI can be used in any of the traditional HMI scenarios described below.

1.3.1 InstantHMI Runtime on a PC (or CE touch panel) accessing controllers

In either scenario (PC or CE) the InstantHMI Runtime Engine renders the tag information from the controllers in terms of HMI Project screens and provides access to all the other functionality built into the HMI-Project.

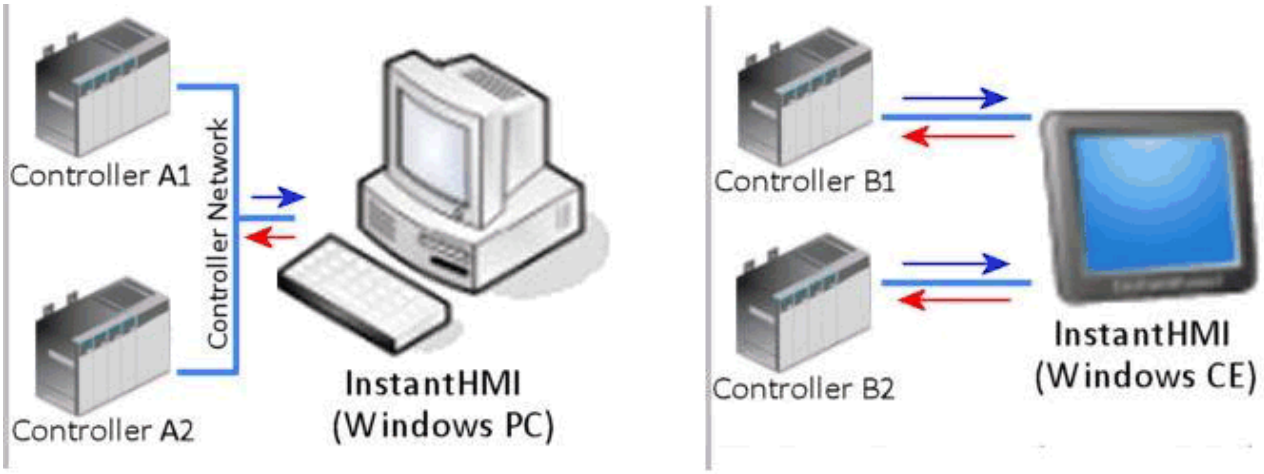


Figure 1-4: InstantHMI Runtime accessing Data from Controllers (Windows PC and Windows CE)

1.3.2 InstantHMI Client (Runtime PC) connected to InstantHMI Server

Note: The term Client-Server is sometimes mis-understood. Here is a simple metaphor: a restaurant scene. The Customer (Client) at the table orders food items with the Waiter (Server). The Waiter can serve any food items (data) available from the Chef (Controller) in the Kitchen (Production Machine).

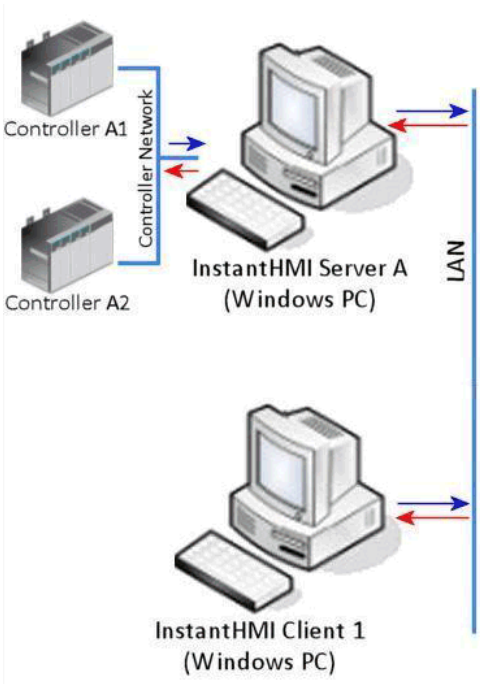


Figure 1-5: InstantHMI Client-Server Setup

In the Client-Server scenario the InstantHMI Runtime Engine on the Client uses the tag information from the controllers served by the Server to render the HMI Project screens. The Server acts as the Data Source for the Client and hence as a go-between the client and the controllers. Here the connection between the Client and the Server is wired LAN and the information exchange uses the SHIP protocol (Software Horizons' Inter-Node Protocol); the Client may also access the Server over the Internet (Section 1.4.1).

1.3.3 Wi-Fi Client connected to InstantHMI Server via Wireless Router

Similar to the previous scenario, the connection between Client 1 and the Server A is wired LAN. In addition, here we show Client 2 (InstantHMI Runtime installed in a Wi-Fi Mobile PDA) accessing the Server over a wireless link using a wired/wireless Router on the LAN. Both Clients interchange information with the Server using the SHIP protocol (Software Horizons' Inter-Node Protocol).

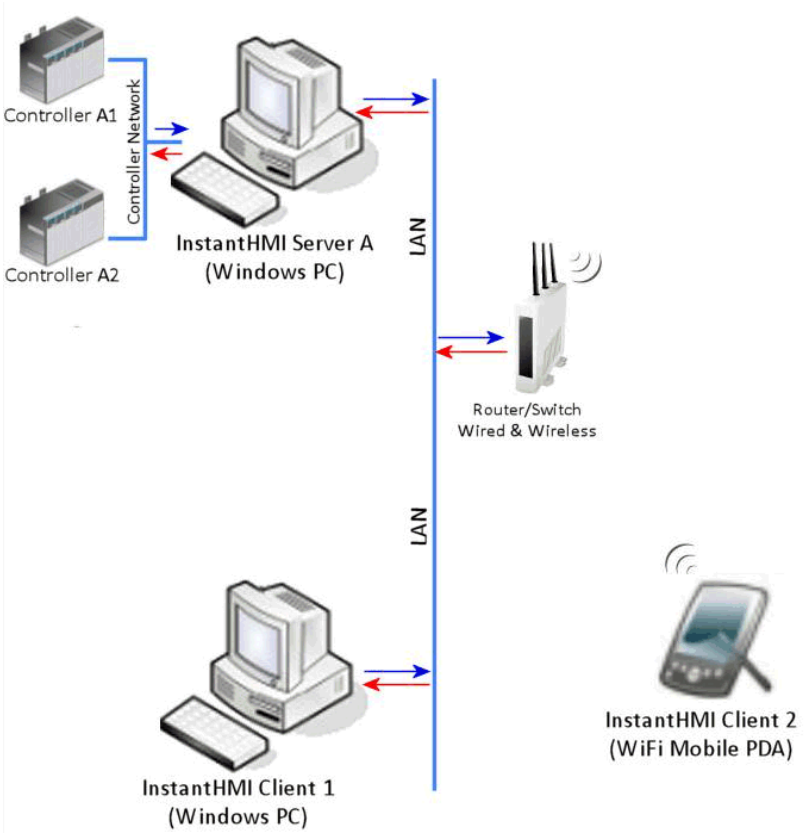


Figure 1-6: Wireless and Wired InstantHMI Clients connected to InstantHMI Server

1.4 Moving to the Cloud: GoToMyHMI

In Section 1.3 we described several traditional scenarios in which InstantHMI Runtime Engines may be used. Here we make our move into the cloud and show how 'Cloud Ready' InstantHMI 6.x Runtime Engines may be setup for access over the Internet and ready to use the GoToMyHMI Services.

The **first generation of GoToMyHMI** incorporated an 'HMI-Gateway in the Cloud'. This was GoToMyHMI as a SAAS implementation with infrastructure (Server, Database, etc.) in the cloud. It was provided as a Subscription Service (monthly or annual) to the user. This service is described in a separate document. As of January 1, 2013 this service is available only by special license arrangement with Software Horizons.

The **second generation GoToMyHMI** incorporated a Web Server (GTMH-WebServer.exe) implementation that can be described as a more general 'HMI-Gateway'; that is, 'HMI-Gateway to the Cloud (Internet) and LAN (Intranet)' that requires a Software product license for InstantHMI Runtime option 'GoToMyHMI: Web Server' for installation at customer site. With this approach there is no infrastructure in the cloud. Such installation may be on the same platform as the HMI-Server (InstantHMI Runtime on PC or CE) or another PC on the same LAN as the HMI-server. With the GoToMyHMI Web-Server implementation InstantHMI Runtime may be remotely accessed from any web browser (iPad, iPhone, BlackBerry, Laptop PC, etc.) over the Internet as well as over the LAN without an Internet.

Customer Perceived Advantages of GoToMyHMI Web-Server over GoToMyHMI Cloud Services:
1. No subscription fees on an on-going basis
2. Customer can enforce its own HMI-Server and Internet access policies
3. No dependence on third party cloud infra-structure
4. Sense of security that its HMI data does not leave its own hardware infrastructure

1.4.1 InstantHMI Server Connection for Internet Access

InstantHMI Runtime Server can also support remote Clients over the Internet using the SHIP protocol (Software Horizons' Inter-Node Protocol). Such remote clients include InstantHMI Runtime installed on a Windows Platform.
Connection to the Internet requires two things:

- DNS server to resolve the domain name you are trying to access into the equivalent IP address, and
- Gateway where your network connects to the Internet.

A Gateway or a Router facilitates communication among hosts that are not on the same logical network (e.g. IP-subnet). The Router receives packets of data on an interface and uses a routing table (logical network locations) to route them to their destination.

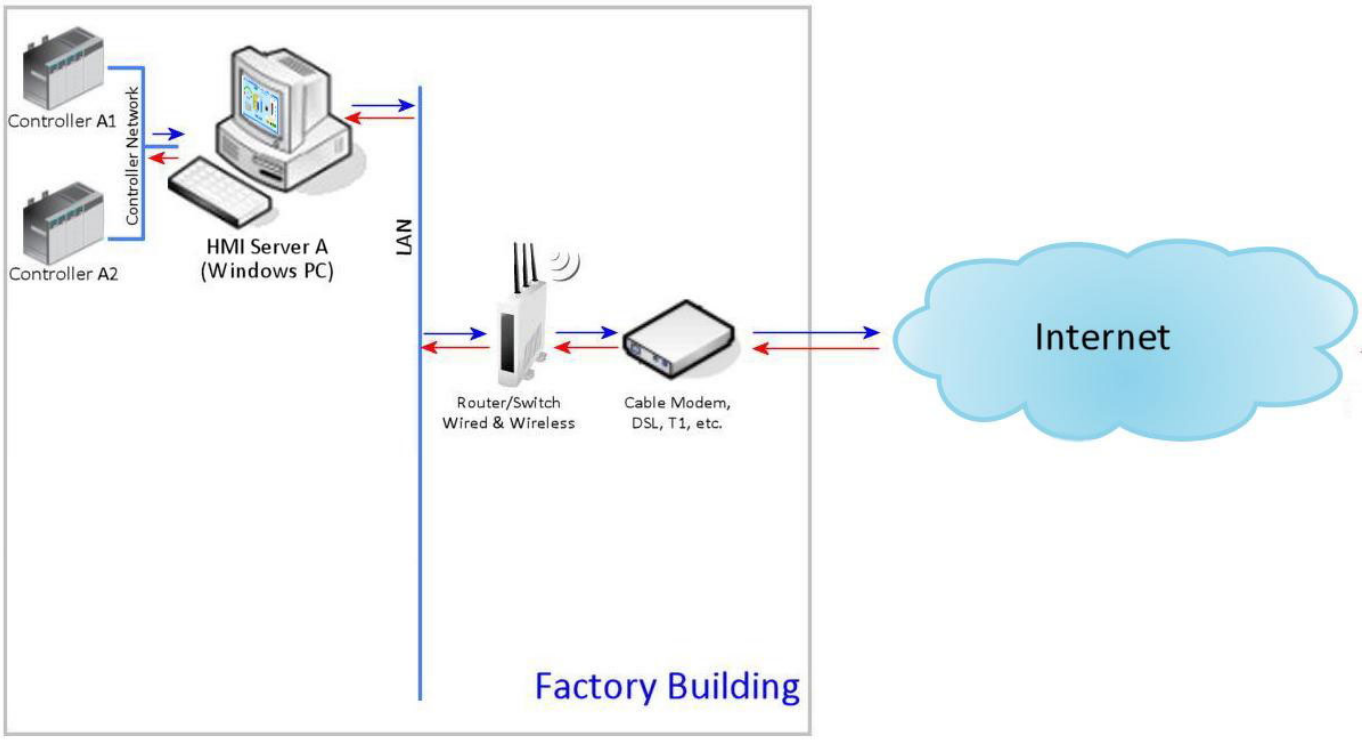


Figure 1-7: InstantHMI Server Setup for Internet Access

The function of a gateway can be performed by hardware, as in the case of Routers, or software, or a combination of both. We use the term 'HMI-Gateway in the Cloud' as a metaphor representing such a generalized gateway. An example of a software gateway is when you use **GoToMyHMI Services** in order to share the Internet connection from your InstantHMI Server with multiple 'Cloud Nodes'. GoToMyHMI gateway not only relays information across networks, but it also performs the 'conversion of protocols' (i.e. HMI project screens and data to browser screen display and data). In addition, GoToMyHMI also performs Node Access Translation (similar to, but not the same as Network Address Translation or NAT) in order to deliver the HMI packets to its destination (from/to InstantHMI Server to/from Cloud Nodes).

1.4.2 InstantHMI Server 'GoToMyHMI Gateway' Setup

To enable Cloud Node(s) access to the InstantHMI Server via the GoToMyHMI Gateway do the following. In LaunchPad select the Project (PLC Demo, in our example), click on Design → Data Sources → GoToMyHMI Gateway → GoToMyHMI Setup. This opens the GoToMyHMI Setup dialog as shown in Figure 1-8.

InstantHMI 6.x is 'Cloud Ready'. Use the check box at the top to enable GoToMyHMI Connectivity with InstantHMI Server. Whenever the HMI-Server (your Runtime PC/CE platform) is running and accessible from the Internet, it will be shown as on-line for remote access by Cloud Nodes; otherwise, it will be shown as off-line.

Enter Customer ID assigned by Software Horizons when your company sets up User subscriptions to GoToMyHMI Services. You may give a convenient name (but unique to each Server) to your InstantHMI Server. By default all Project screens are accessible from Cloud Nodes. Select any Screens you wish to remove from this access list and click on Remove button. Leave the Screen Update time at the default value; it can be changed by the User at the Cloud Node to suit the bandwidth and cost of Internet access from the Cloud Node. Enter the email address of Alarm Recipient(s) who will receive email when an alarm condition arises on tags that are marked for alarm email notification (in the Tag Manager). Leave the Alarm Status Update at the default 1 second or change it as desired. By clicking the link in the alarm Emails they can remotely access the alarm page from their Cloud Node and acknowledge selected alarms. Leave the Alarm Status Update time at the default value (a slower update time may reduce bandwidth requirements).

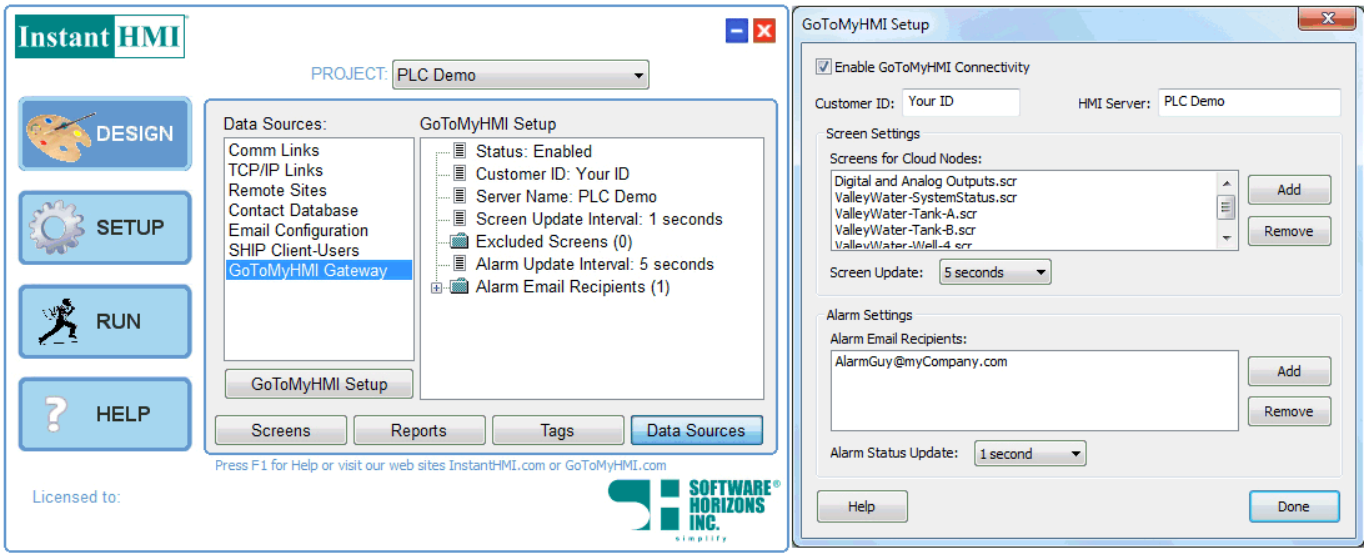


Figure 1-8: LaunchPad → Design → Data Sources → GoToMyHMI Gateway → GoToMyHMI Setup

Your InstantHMI Server 'GoToMyHMI Gateway' Setup is then as shown in Figure 1-8. Click on Done to complete the InstantHMI Server setup, which is now ready for cloud access over the GoToMyHMI Gateway from any remote browser. The GoToMyHMI Setup parameters are saved in the Project.ini file in your InstantHMI Project folder.

1.4.3 GoToMyHMI Services

GoToMyHMI Web Server (GTMH-WebServer.exe) is licensed as a Runtime option and provides the GoToMyHMI Services without a subscription. The Services currently offered are:

- **GTMH/Monitor**: remotely access your HMI-Server Project and monitor any screens.
- **GTMH/Alarm**: In addition to GTMH/Monitor, remotely access the Alarm Page and ACK any alarms.
- **GTMH/Control**: In addition to GTMH/Alarm, remotely enter Discrete and/or Analog tag values through Screen Objects.
- **GTMH/Admin**: Manage your account user names and passwords etc. using GoToMyHMI Setup. The file GTMH-WebServerUsersDb.idb contains the user information.

1.5 InstantHMI Architecture

The important elements in the design and implementation of a Human Machine Interface (HMI) are shown in the InstantHMI 6.x Architecture block diagram below.

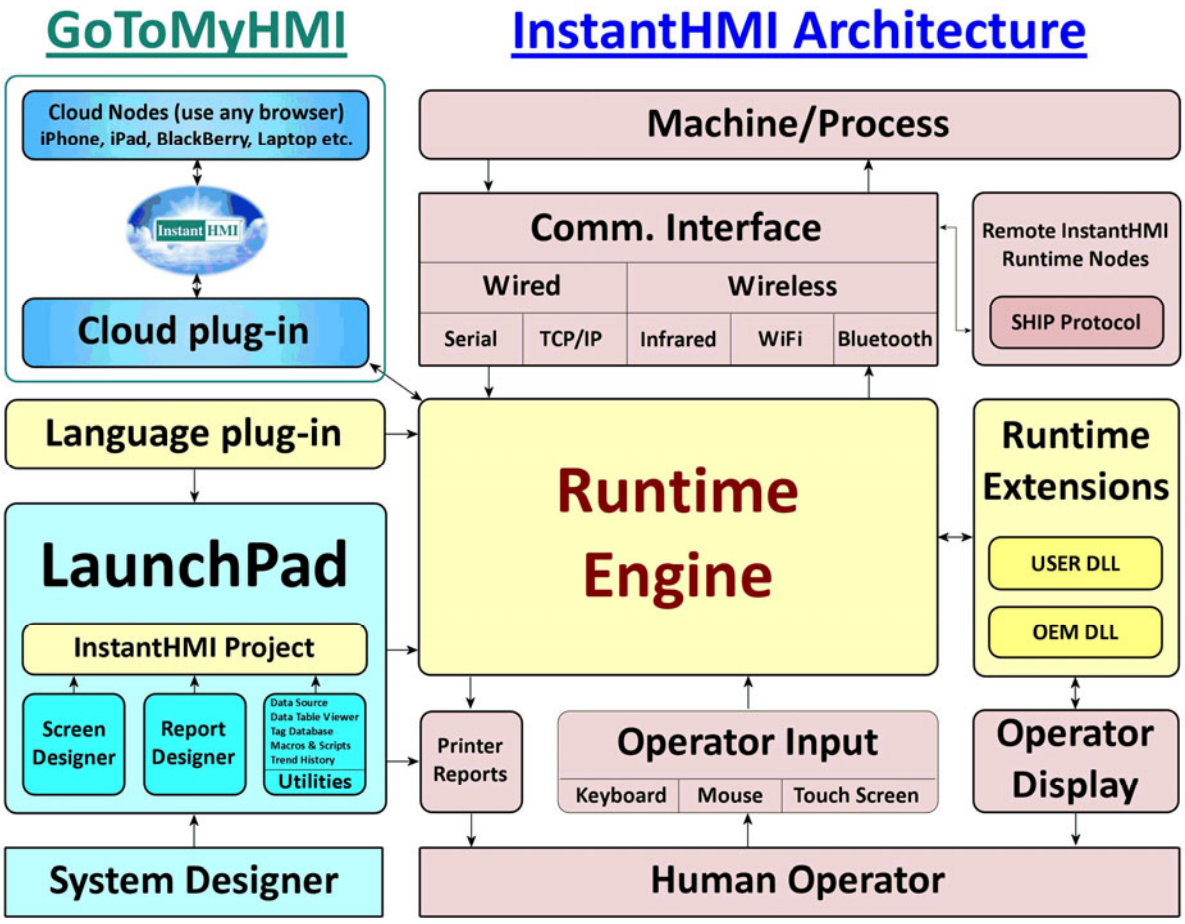


Figure 1-9: InstantHMI Architecture

The **LaunchPad** Development platform, enables you to design the HMI-Project.

1. Design project screens, reports etc. to suit your HMI application requirements. An InstantHMI Project implements the 'model of the Process or Machine Control Application' for the benefit of operators, supervisors and management who are responsible for the proper and efficient operation of the machine and the plant. Your Project may include some or all of the **Project Elements** listed below:
    - Tag Database,
    - Screens,
    - Report/Spool Templates,
    - Data Sources (controller communication setup parameters and drivers),
    - Project Users, and
    - Target Runtime Platforms (PC, PDA, and CE) where project will be deployed.
      Windows PC (XP, Vista, 7), Windows CE.NET touch panels, and Windows Mobile (PDAs, Smartphones)
2. Setup all project elements (and users) so it is 'Ready to Run' on the target platform.
3. Deploy the project on the target platform (PC, CE, PDA) where InstantHMI Runtime Engine is installed.

The **Runtime Engine** allows access to all the HMI-functionality built into the HMI-Project. The Runtime uses available Communication Link(s) and its Communication Interfaces to retrieve Process/Machine information and renders them on the Operator Display for monitoring by the Human Operator as well as enabling Operator input (using displayed screen objects and keyboard, mouse or touch hardware) to control the Process/Machine operation. The information for Monitoring and Control of your machine/process is presented using display data objects on project screens.

These display data objects get their parameters from a tag object in the Tag Database. Most project screens include Macros and Scripts that make the project screens more powerful and convenient. Reports provide information to assist supervisory and management personnel. Runtime Engine may also log Data for Historic Trending analysis.

InstantHMI from Software Horizons implements a 'Design Once, Deploy Anywhere' HMI technology. It incorporates a LaunchPad Designer to design your HMI Project which can then be deployed on any target platform to be rendered by the InstantHMI Runtime Engine software installed on that platform. InstantHMI incorporates a **Language plug-in**, which makes it 'Language Ready' for localization in any language. We provide all strings to be translated in an Excel sheet ready for you to translate; when we receive the translation it can be 'plugged-in' to the InstantHMI software by us. When this is done, the Designer and the Runtime will be in your language. So if your Windows OS is in your language then the entire HMI project design and runtime execution of your HMI project will be entirely in your language (For example Chinese, Spanish, etc.) Please contact Software Horizons for your language requirements and the details of our policy. In addition, InstantHMI 6.x incorporates a **Cloud plug-in** to makes it 'Cloud Ready' so that the InstantHMI Project elements are remotely accessible from any Browser (iPad, iPhone, Android, BlackBerry, Laptop PC, etc.).

The LaunchPad Project Management platform enables you to do everything you need in the InstantHMI framework:

- Design project screens, reports etc. to suit your application requirements.
  An InstantHMI Project implements the 'model of the Process or Machine Control Application' for the benefit of operators, supervisors and management who are responsible for the proper and efficient operation of the machine and the plant.
- Setup all project elements (and users) so it is 'Ready to Run'; Deploy to target platform (node), if different from Designer node.
- RUN the project (if the target is the same PC on which the LaunchPad is installed).
  The information for Monitoring and Control of your machine/process is presented using display data objects on project screens. These display data objects get their parameters from a tag object in the Tag Database. Most project screens include Macros and Scripts that make the project screens more powerful and convenient. Reports can be designed to assist supervisory and management personnel.
- Help provides access to Documentation and Registration/Activation information.

Figure 1-10: LaunchPad at Startup and in Design Mode

InstantHMI Projects are managed (created, stored, deployed, etc.)using tools included in the LaunchPad (Section 2). Critical information used to define project elements is stored in Databases (Section 3). The LaunchPad includes a Screen Designer (Section 4), Managers for Tag Database and Data Sources, Editors for Reports (Section 5), Macros (Section 6), and Scripts (Section 7), and utilities such as Data Table and Screen Capture.

Your Project may include some or all of the **Project Elements** listed below:

- Tag Database (Section 2.3.4, Section 3.3),
- Screens (Section 2.3.1, Section 4),
- Report/Spool Templates (Section 2.3.3, Section 5),
- Data Sources (Section 2.3.5, Section 3.1), (controller and InstantHMI IP node address database, communication setup parameters and drivers),
- Project Users (Section 2.4.2), and
- Target Platforms (PC, PDA, CE) where project will be deployed (Section 2.4.1).

The LaunchPad enables you to deploy InstantHMI Projects to one or more Runtime Engine platforms of your choice: PC, PDA or Windows CE (Sections 9 and 10). The Runtime uses available Communication Link(s) (Section 8) and its Communication Interfaces (Sections 11 and 12) to retrieve Process/Machine information and renders them on the Operator Display for monitoring by the Human Operator as well as enabling Operator input (using displayed screen objects and keyboard, mouse or touch hardware) to control the Process/Machine operation. Runtime Engine may also log Data for Historic Trending analysis (Section 13).

1.6 Get Started Immediately

- Review InstantHMI License (see front of the manual)
- Review Activation / Registration Policy, moving and removing the Activation (Appendix A)
- Install InstantHMI LaunchPad on Windows PC and the Runtime Engine on target platforms (Windows PC, CE, Pocket PC etc.). See Appendix A for details.
- Register and Activate InstantHMI on all nodes (PDAs and Desktop)

Before proceeding further it is important that you take a minute to fill in and email, fax or mail your Registration Form. This is the only way we have of informing you about important changes and improvements to InstantHMI. Special update and support privileges are only available to Registered customers, so please send in your registration form promptly.

We will get you up and running with InstantHMI and your controller on 'Day One'.

Run the InstantHMI LaunchPad. (Figure 1-10) You will see the LaunchPad with four Projects in the pull-down list: Demo, MyProject, 'Quick Start PC', and Sample Project. You will also see a Thumbnail view of all the screens included in the selected project (Demo).

Project	Screens*	Tags	Remarks
Demo	17	242	Includes various InstantHMI features that you can learn from.
MyProject	1	2	A minimal stub project, Template to start your own project.
Sample Project	3	18	Similar to MyProject, enhanced Template to start your own project.
Quick Start - PC	2 (+4)	21	A 'Water Supply System' application used as a training tool.
Template	0	16	Hidden project used as new project template by 'default'.

* In addition, a Watch list screen (provided automatically) may be enabled by you as a runtime option.

The **Demo** project includes various InstantHMI features that you can learn from. We suggest you run the Demo project (that is, in LaunchPad select 'Demo' in the Project pull-down list and then click RUN) and do a quick 2-minute review first. This will provide you with a quick overview of InstantHMI features that you can benefit from. You may re-visit any screen, script etc. in the Demo project at a later time for a detailed study.

To make it convenient for you, when you complete installing InstantHMI on your PC, the LaunchPad (which serves as the command and control center from which you may access the main program elements of InstantHMI) appears and presents you with an opportunity to run the 2-minute demo. Run this 2-minute Demo to get a feel for various InstantHMI features that you can use in your own application. Throughout this manual we will use the Demo project for illustrative purposes. We recommend that you use the Demo project elements (Screens, Scripts, Macros, etc.) as a tool to shorten your learning curve in using InstantHMI for your application solution. A sample screen from the Temperature Monitoring application included in the Demo

project (Figure 1-11) shows boiler and pump states and allows the input of Temperature Setpoint and monitoring of (High/Low Temperature) alarm conditions.

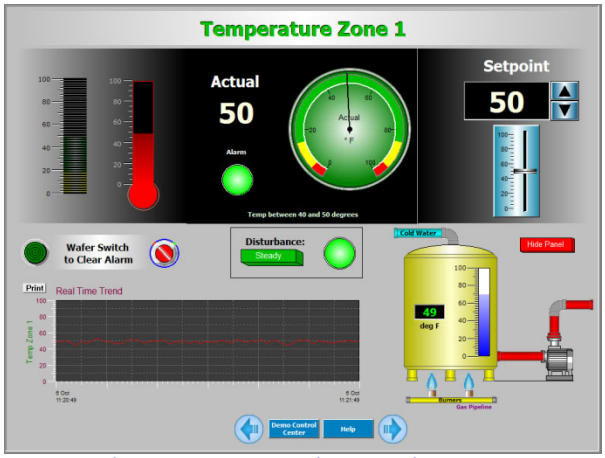


Figure 1-11: Demo Project-Sample Screen

When you create a new project, the '**Template**' folder is used as the project template by 'default'. You may use **MyProject**, a minimal stub project with a simple screen and 2 (controller) tags, as a template for your initial PLC communication testing. For your convenience, **Sample Project** provides the same controller tag functionality as in MyProject but with enhancements (scaled tag values, system date and time tags, and a runtime script simulating a simple 'Tank Level Control' application). You may use this 'Sample Project' as a learning tool and as a template for your own project. (Of course, the runtime script 'Runtime.sct' in 'Sample Project' should be eliminated or replaced with logic to suit your application).

We recommend that for self-training on screen design, controller interface and project design you refer to the separate document **'Quick Start Guide'**. We include below a brief description of the Water Supply System used in the Quick Start Guide for illustration. You may access the 'Quick Start Guide' by clicking the Help button at the bottom left of the LaunchPad (Figure 1-10).

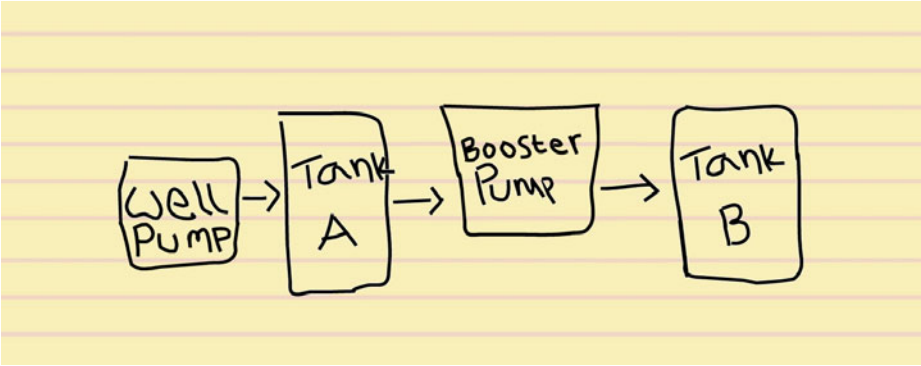


Figure 1-12: Application Example - Water Supply System

The Water Supply System for a small community consists of two Tanks A & B, a Well Pump, and a Booster Pump station monitored and controlled from a central facility. Tank A supplies water to community members living in its vicinity. Tank A draws its water from the Well by initiating a 'Required' command to the Well (Pump). Tank B supplies water to community members living in its vicinity. Tank B draws its water from Tank A by initiating a 'Required' command to the Booster Pump. Manual overrides are required at the central facility to operate Well Pump and Booster Pump. All Remote sites are connected to the host central site's PLC via radio RTUs. The variables of interest (tabulated below) are maintained and the site logic is programmed in the PLC.

Our task is to provide a Human Machine Interface for the operator(s) in the Water Supply System facility. InstantHMI can provide such an interface on multiple platforms. The HMI solutions on these platforms are very similar.

2 LaunchPad Development System

An InstantHMI Project implements the 'model of the Process or Machine Control Application' for the benefit of operators, supervisors and management who are responsible for the proper and efficient operation of the machine and the plant. The project design and setup are done using the LaunchPad HMI-Project Development and Management System.

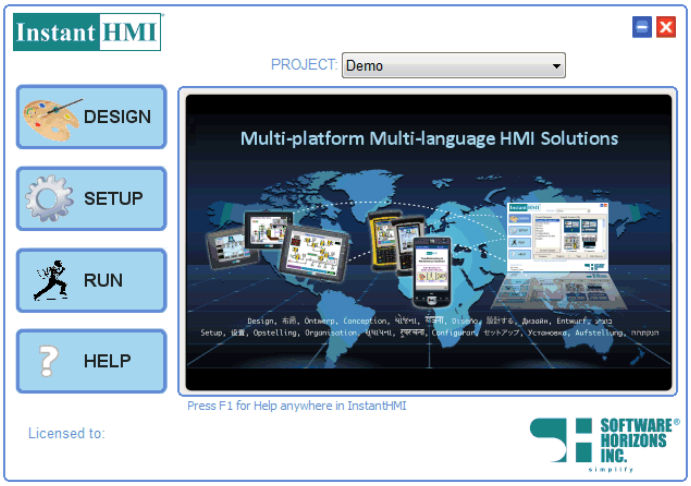


Figure 2-1: InstantHMI LaunchPad Before Activation

Note: For customer convenience in making minor changes to Project elements, we also provide a Mini-LaunchPad running on the CE platform (Section 2.7) and a Micro-Launchpad running on PDA (Section 2.8).

The LaunchPad includes the following Command Buttons:

- Design
- Setup
- Run
- Help

The pull-down list at the top allows you to select one of the available projects. If you select 'New Project' here, the **New Project Wizard** (Section 2.4.1) pops up to guide you through creation of a new project for your application.

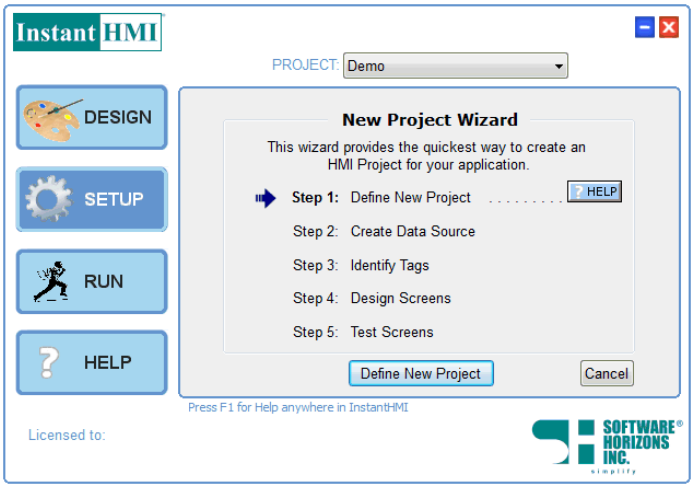


Figure 2-2: InstantHMI LaunchPad After Activation

When you click on a Command Button a dialog box pops up in the LaunchPad panel, which gives access to the associated project elements and tools. The hierarchy of project functions and the associated Project Elements (Screens, Databases, etc.) as well as the Tool or Utility used in the design and setup are shown in Figure 2-3.

Command	Functions	Project Elements	Tool or Utility	See Section
Design	Screens	Screens (Thumbnail)	Screen Designer	4
		Screens (List	Screen Designer	4
		Scripts	Script Editor	7
		Macros	Macro Editor	6
		Tasks	Task Scheduler	16
		Recipes	Recipe Editor	3.6
		Configurations	Configuration Editor	3.6
		Troubleshoot Scripts	Troubleshoot Editor	2.3.2
		Images	Image Capture Utility	
	Reports	Printer Reports	Report Designer	5, 16
		Spool Reports	Report Designer	5, 16
		Alarm Reports	Alarm Viewer	4.6.7
		Historic Trends	Historic Trend Utility	13
		Logs	Log Viewer	4.6.12
	Tags	Tag Database	Tag Manager	3.3
		Alarm Database	Alarm Manager	17
		Data Viewer	Data Viewer	3.2
		Datalog Tags	Tag Manager	3.7
		Datalog Events	Datalog Events Dialog	3.7
		Message Groups	Message Manager	3.4
		Image Groups	Image Manager	3.5
	Data Sources	Comm Links	Data Source Manager	3.1, 8
		TCP/IP Links	IP Manager	2.3.5
		Remote Sites	Remote Site Manager	
		Contact Database	Contact Database	
		Email Configuration	Email Configuration	17.3.3
		SHIP Client-Users	Client-User Manager	
		GoToMyHMI Gateway	GoToMyHMI Setup	
Setup	Project	New Project	New Project Dialog	2.4.1
		Remove Project	Remove Project Dialog	
		Change Platform	Select Platform Dialog	
		Users	User Profile Manager	2.4.2
		Protect	Project Protection Utility	2.4.3
		Deploy	Deploy, Retrieve Dialog	2.4.4
	Screens	Project Screens	Screen Designer, Add, Insert, Remove, Delete Dialog	2.4.5
	Reports	Printer Report Templates	Report Designer, Assign, Remove, Delete Dialog	2.4.6
		Spool Reports Templates		
	Special Tags	Print Control	Tag Manager, Assign, De-assign Dialog	2.4.7
		Spool Control		
		Switch Screen		
		Update Enable		
		Recipe Enable		
Run	Overview	Project Runtime Setup	Runtime Setup Dialog	2.5.1
	Options	-	Target Runtime Engine Emulation	2.5.3
	Reports	Project Runtime Reports	Runtime Report Viewer	2.5.4
	Run / EmulateTarget		PC Runtime Engine	2.5.2
Help	Register/ Activate	Designer/ Runtime Engine	Activation Utility	2.1
	Order Help	InstantHMI Components Used	InstantHMI Order Page (web)	
	User Manual	Documentation Manual	Adobe Acrobat Viewer	
	Quick Start	Quick Start Guide		

Figure 2-3: Project Functions, Associated Project Elements and Design Tools

2.1 Help

The LaunchPad **Help** command displays program version information (Figure 2-4) and also provides three buttons: Activate, User Manual, and Quick Start. Note: If you double click the Runtime Engine or LaunchPad items on this panel, the OEM acronym will be displayed. Standard is displayed for the standard version meant for all non-OEM customers.

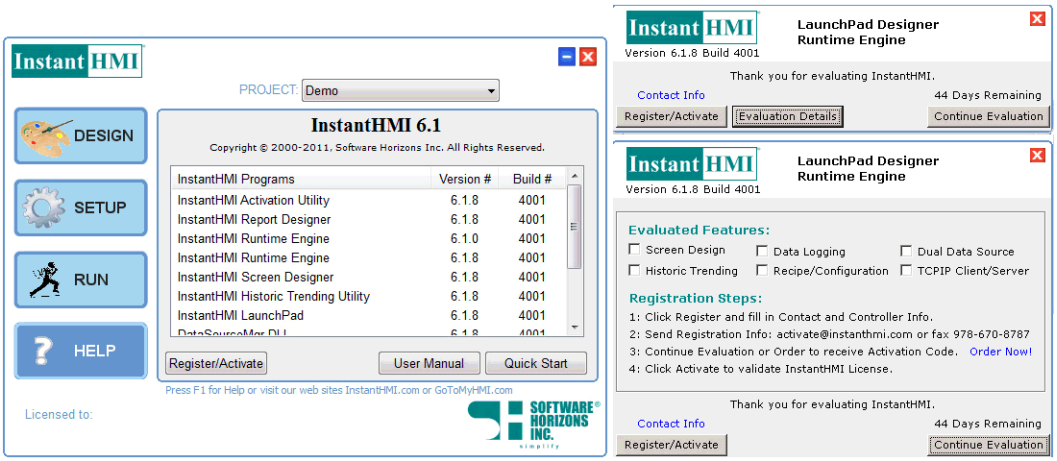


Figure 2-4: LaunchPad → Help

The **Register/Activate** button allows you to create Registration information to be sent to Software Horizons. Registration is required to receive your license activation (after your InstantHMI software order or to request an evaluation before you order). The **Order Help** button presents additional information to help you. (This button will disappear once you have Activated your license.) Activation is essential to access all the installed features in your InstantHMI software (Appendix A). The **User Manual** button displays the InstantHMI Manual (Figure 2-5). (Adobe Acrobat reader needed to view this PDF file may be downloaded from www.InstantHMI.com/acrobat). The **Quick Start** button displays the InstantHMI Quick Start Guide (PDF file).

IHMI6-Manual.pdf (SECURED) - Adobe Reader
File Edit View Window Help
Tools Comment
The file you have opened complies with the PDF/A standard and has been opened read-only to prevent modification.
Bookmarks
1 InstantHMI(for your Application
2 LaunchPad Development System
3 Databases
4 Screen Designer
5 Report Designer
6 Macro Manager
7 Script Editor
8 Communication Links
9 Runtime Engine (PC)
10 Runtime Engine (CE and PDA)
11 TCP/IP Interface and SHIP Protocol
12 OPC Interface
13 Historic Trend Utility
14 User DLL
15 Quick Start Guide - Training Objectives
16 Task Scheduler in Runtime
17 Alarm Management
A. Installation, Registration and Activation
B. FAQ - Frequently Asked Questions
C. Communication Drivers
D. Solution for Your Controllers
InstantHMI 6.1
'Cloud Ready'
SOFTWARE HORIZONS INC.

Figure 2-5: LaunchPad → Help → User Manual

2.2 Login

After the installation of InstantHMI usually an Administrator would setup Project Users (using the User Profile Manager discussed in Section 2.4.2) with user names, passwords and access privileges. Login password access control will be enabled when the User Manager is enabled. You may play the role of the system administrator (using default Login User Name: **Administrator**, Password: **a**) and setup users, passwords and assigned functions. The InstantHMI LaunchPad maintains a registry of users, their passwords and assigned functions. The System Integrator is responsible for setup of this registry and may designate a System Administrator at the customer site to setup additional users, passwords and assigned functions.

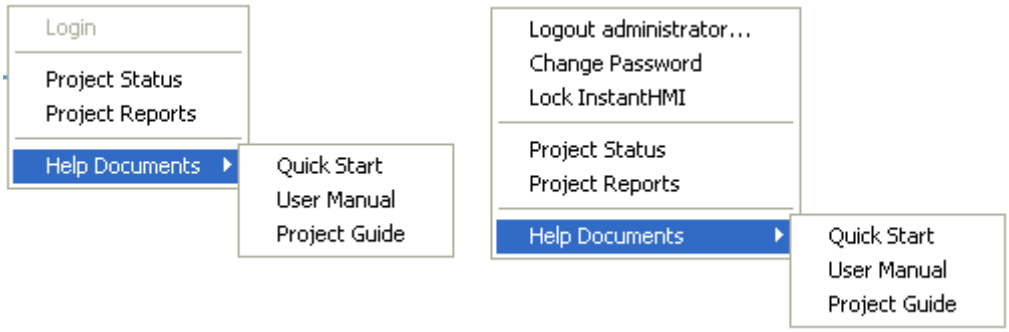


Figure 2-6: LaunchPad Pop-up Dialog (Before and After Login)

To Login you may right click anywhere on LaunchPad border area to access the pop-up dialog (Figure 2-6) and select 'Login'. If required, you must Login to access assigned InstantHMI functions. If you try to access any protected functions requiring user authentication, the **Login** dialog will appear; you may then enter your User Name and Password. Depending on your authentication InstantHMI will allow access to the assigned functions and deny access to other unassigned functions.

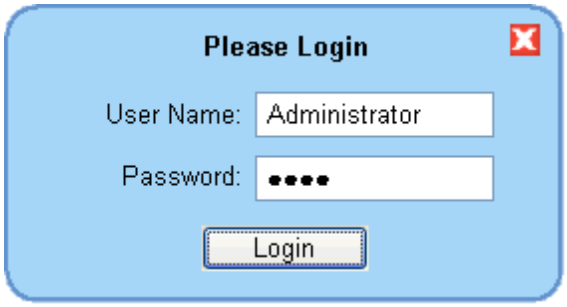


Figure 2-7: Login Dialog

After you login, you may access the pop-up dialog (Figure 2-6) to do the following:

- Change Password
- Lockout InstantHMI
- Logout

If you select 'change password' a dialog box appears: enter your old password (you used to login), enter your new password and enter it a second time to confirm your new password selection and then click Change.

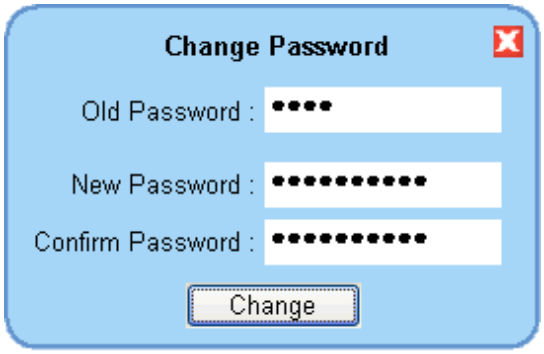


Figure 2-8: Change Password

To Logout, select 'Logout <User Name>' and enter your password. The system will default to user 'Guest' if no one is logged. The system administrator can decide what InstantHMI functions are accessible when user is 'Guest'.

To leave InstantHMI in a locked state, select ' Lock InstantHMI'. A Resume Screen appears and all LaunchPad functions are locked out until you click on Resume button and enter your password.

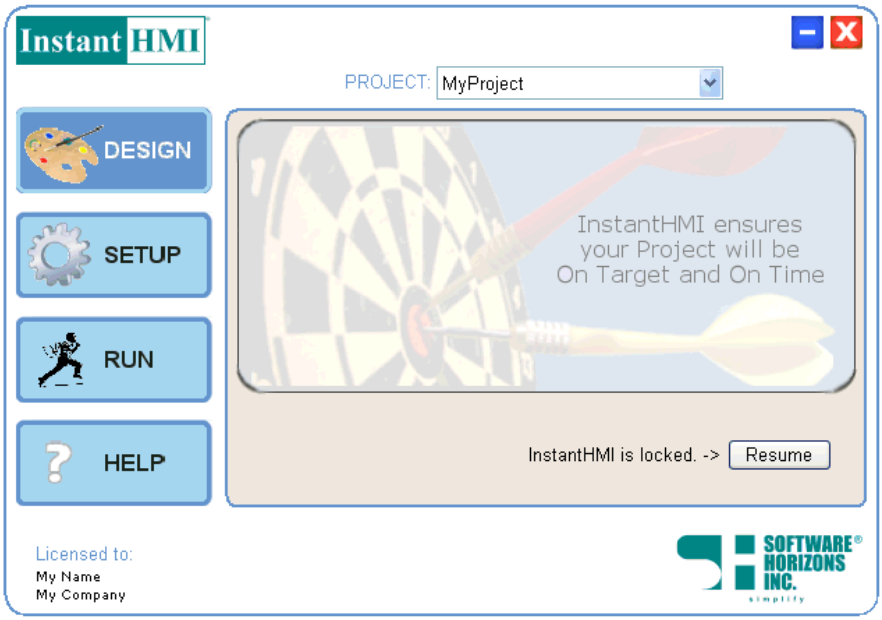


Figure 2-9: Locking InstantHMI LaunchPad

2.3 Design

2.3.1 Design → Screens

InstantHMI implements a '*Design Once Deploy Anywhere*' technology. The project Tag Database can be transferred to any target platform, which has an installed InstantHMI runtime engine. Likewise, the project screens created in the Screen Designer will be transferable to Windows PC, CE and PDA platforms. Screens for different platforms with different screen resolutions may be designed on the LaunchPad platform and converted (automatically) while deploying on the target platform.

Figure 2-10: Design → Screens (Thumbnails View and List View)

The Design → Screens command shows all the screens included in the selected project (Demo, in our example) as Thumbnail bitmaps or in a list. If you right click on any screen in the preview panel you will see a popup menu of options: New Screen and Edit Screen. Double clicking on a screen in the preview panel invokes the **Screen Designer** (Section 4) and allows the screen objects to be viewed and edited. Note: Screen editing access may be restricted to designated users via Login password control in the User Manager (Section 2.4.2).

The InstantHMI Screen Designer allows you to assign tags from the Tag Database to any data display objects you include on the screen. If the desired tag definition is not already in the Tag Database then you may create a tag on the fly using the Tag Editor, or if no tag specification is desired at the time then a default tag (linked to local memory) will be generated. You may edit the default tag at a later time or use it as is for preliminary testing of screen objects. (Section 2.3.4)

Table in Figure 2-11 briefly summarizes the screen elements, associated design tools and a reference to Sections where these are discussed.

Command	Function	Screen Elements	Tool or Utility	See Section
Design	Screens	Screen (Objects)	Screen Designer	4
		Scripts	Script Editor	7
		Macros	Macro Editor	6
		Tasks	Task Scheduler	16
		Recipes	Recipe Editor	3.6
		Configurations	Configuration Editor	3.6
		Troubleshoot Scripts	Troubleshoot Editor	2.3.2
		Images	Image Capture Utility	3.5.1

Figure 2-11: Designing Screen Elements

2.3.2 Design → Screen → Troubleshoot Scripts

Click on Design → Screen → Troubleshoot Scripts → Troubleshoot Editor button (provided your System Administrator has granted you this access privilege) to create a custom troubleshooting script for your application to be downloaded to the Runtime Engine on any supported platform. Figure 2-12 shows a sample troubleshoot script database (IHMI-TroubleshootDB.idb) for a Watlow Temperature Controller application.

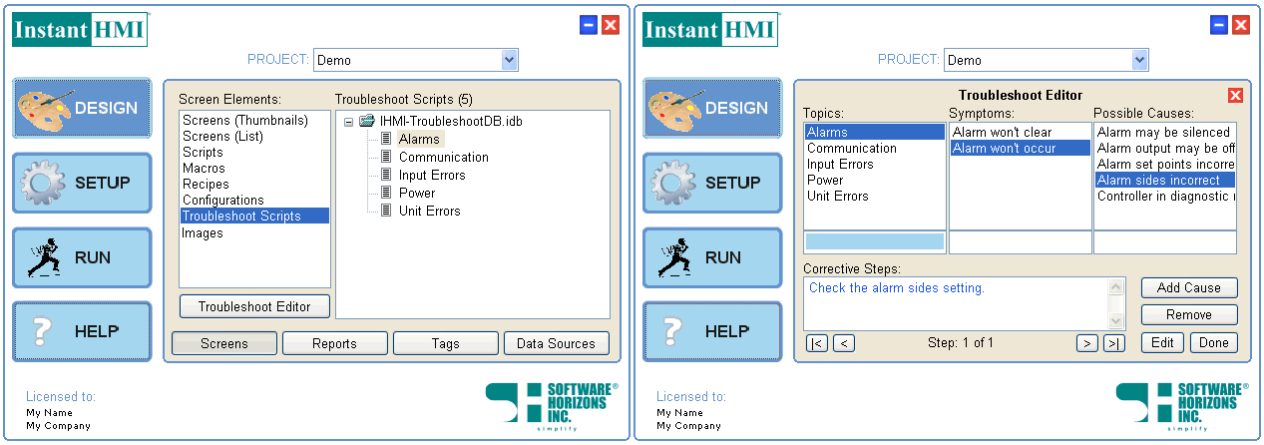


Figure 2-12: Design → Troubleshoot Scripts and Troubleshoot Editor Dialog

Troubleshoot editor has four (hierarchical) levels for script customization:

- Topics,
- Symptoms,
- Possible Causes, and
- Corrective Steps.

'Topics' identify different subsystems or areas (in the application) that are prone to have problems. Click on the 'Topics' entry field to enter a 'New Topic' (as shown) and click on 'Add Topic' button.

Note: 'Add Topic' button will be labeled as 'Add Symptom', 'Add Cause' or 'Add Step' depending on context. Use the 'Add …', 'Remove', and 'Edit' buttons at the chosen hierarchical level of the script for script customization. The text entry field is below the corresponding list (Topics, Symptoms, Possible Causes). To add an entry, enter its text and click 'Add …'. To remove an entry, select the entry from the displayed list and click 'Remove'. To edit an entry, select the entry and enter the new text and click on 'Edit' button.

The text entry field for Corrective Steps is scrollable to allow detailed multi-line entries. Also, one or more action steps may be required to correct a selected Possible Cause. To add a 'Corrective Step', enter its text in Corrective Steps text field and click 'Add Step' button. Use the |<, <, >, >| buttons to select any specific corrective step. To remove a corrective action step, select it and click the Remove button. To edit a corrective action step select it, enter the new text, and click the 'Edit' button.

For any selected topic (Example: Alarms), click on the 'Symptoms' entry field to enter a symptom. Repeat entering additional symptoms if desired. Two symptoms are shown for the topic 'Alarms': Alarm won't clear, Alarm won't occur. For each Symptom add a list of 'Possible Causes' for the symptom that the user can identify (example: Alarm set points incorrect) and then proceed to enter the 'Corrective Steps' script to assist in troubleshooting the problem (example: Step 1 of 1: Check the operation mode). Finally, click on 'Done' button.

A Troubleshoot viewer has been implemented. You can access it using 'Alarm Viewer -> Troubleshoot' button as well as from the Runtime menu (right-click to pop-up Runtime-menu and click on 'Help → Troubleshoot'.

2.3.3 Design → Reports

When you click on Design → Reports button, you will see the Available Report types for the selected project in the left panel. To create a new printer report, select its type (Printer Report) in the left panel and then click on the associated design tool (Report Designer) button. To edit an existing printer report, select its type in the left panel and then double-click on the specific report name in the right panel.

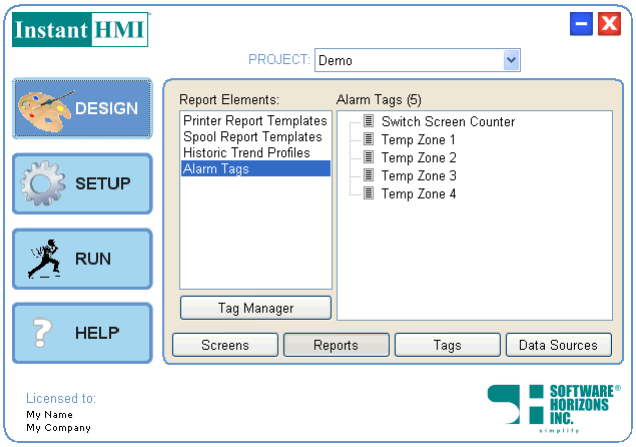


Figure 2-13: Design → Reports

Other Report types (Spool Reports, Alarm Reports, Historic Trends and Logs) are created or edited in a similar manner. The LaunchPad provides access to the Report Designer (Section 5) to create the spool and printer report templates that can be used by the runtime engines to produce printer and spool reports. In addition Special Tags (Section 2.4.7) can be setup in the LaunchPad to generate event driven reports and logs. Table in Figure 2-14 briefly summarizes the report elements, associated design tools and a reference to Sections where these are discussed.

Command	Function	Report Elements	Tool or Utility	See Section
Design	Reports	Printer Reports	Report Designer	5
		Spool Reports	Report Designer	5
		Historic Trends	Historic Trend Utility	13
		Alarm Tags	Tag Manager	3.3.1

Figure 2-14: Designing Report Elements

The LaunchPad can collect all Reports produced in the various runtime engines: Printer, Spool, Datalogs, Alarm Logs, Event Logs, System/User activity logs, etc.

2.3.4 Design → Tags

The screen data display objects get their parameters from a tag object in the Tag Database. The data source for the tag provides the *raw data* of the tag object. The screen data display object then translates the raw data into the chosen *display format* of the screen object for your viewing on the screen. Clicking on Design → Tags and selecting the Project Element 'Tag Database' displays the tags defined in the tag database (Figure 2-15).

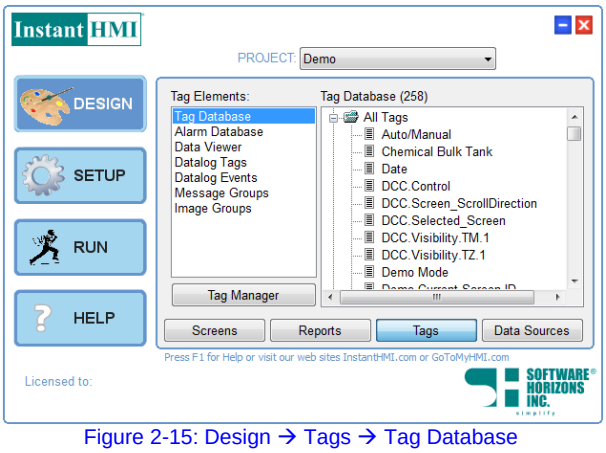


Figure 2-15: Design → Tags → Tag Database

Table in Figure 2-16 briefly summarizes the tag elements, associated design tools and a reference to Sections where these are discussed.

Command	Function	Tag Elements	Tool or Utility	See Section
Design	Tags	Tag Database	Tag Manager	3.3
		Alarm Database	Alarm Manager	17
		Data Viewer	Data Viewer	3.2
		Datalog Tags	Tag Manager	3.7
		Datalog Events	Datalog Events Dialog	3.7
		Message Groups	Message Manager	3.4

Figure 2-16: Designing Tag Elements

The tags in the InstantHMI Tag Database have separate raw data and display format parameters. Depending on the raw data source, each tag can have an IP address assigned to it in the Data Source → IP Manager. The IP Manager maintains a list of IP addresses, port numbers, and descriptive names for the devices (controller and InstantHMI runtime nodes). The Data Source entries include a driver name so that InstantHMI can *support multiple brands of controllers over the same TCP/IP network simultaneously.*

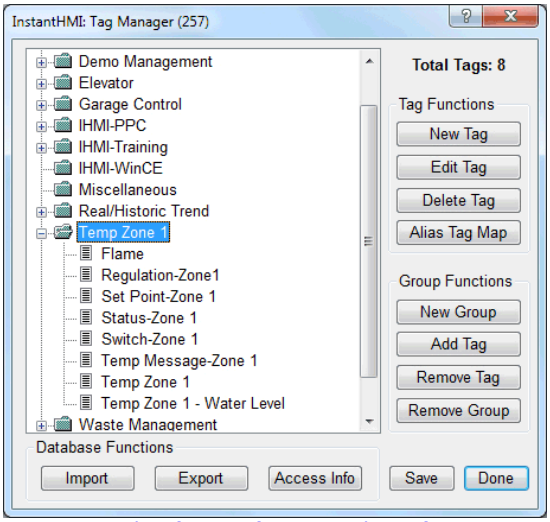


Figure 2-17: Design → Tags → Tag Database → Tag Manager

The InstantHMI Screen Designer allows you to assign tags from the Tag Database to any data display objects you include on the screen. If the desired tag definition is not already in the Tag Database then you may create a new tag on the fly using the Tag Editor, or if no tag specification is desired at the time then a default tag (linked to local memory) will be generated. You may edit the default tag at a later time or use it as is for preliminary testing of screen objects.

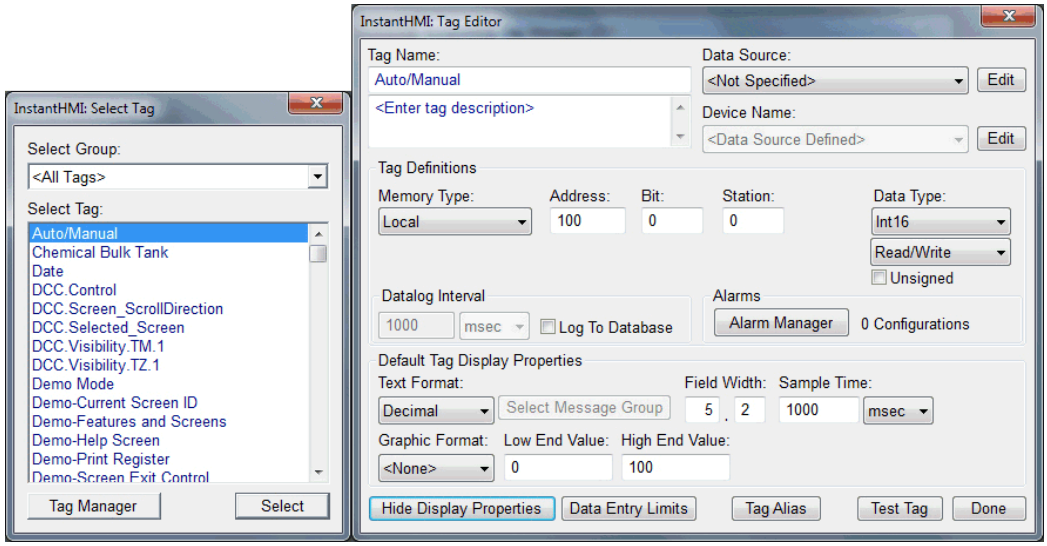


Figure 2-18: Tag Editor

The Tag Manager (implemented as a DLL) serves as a common interface for use with the Screen Designer, Runtime Engine, Report Designer, and other LaunchPad utilities. The Data Table

implementation in InstantHMI allows for rapid creation of pre-tested tags, which can be transferred to the Tag Database. The Tag Manager allows for automatic tag name creation and tag customization where prefix and postfix strings can be included in tag names. The prefix and postfix may be variable based on the memory type, data type, and other such parameters. The tag names can be edited to suit your preference at a later time.

2.3.5 Design → Data Sources

InstantHMI implements a Data Source Manager (as a DLL) that maintains a list of all the data sources. The data source identifies where the runtime data will come from. Typically, field sensor devices bring the physical plant/machine data to the I/O modules on the controller. As far as InstantHMI is concerned the raw data is stored in the controller memory. The controller (stations) may be in a network. The communication link between the InstantHMI node and the raw data may be any of the following:

- direct serial link,
- infrared link,
- TCP/IP link to controller,
- TCP/IP link to a remote InstantHMI node, to which the data source is linked,
- Barcode Scanner, and
- OPC Server (to which the data source is linked).

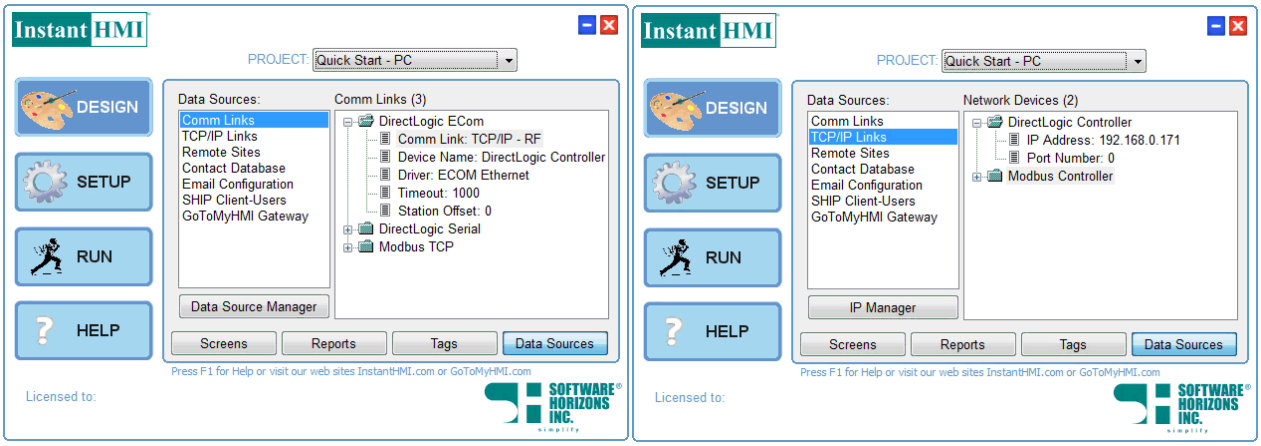


Figure 2-19: LaunchPad → Design → Data Sources

To request and receive data from the controller, a Communication Protocol must be followed; this protocol is incorporated in the communication driver in InstantHMI. Table in Figure 2-20 briefly summarizes the Data Source elements, associated design tools and a reference to Sections where these are discussed.

Command	Function	Data Source Elements	Tool or Utility	See Section
Design	Data Sources	Comm Links	Data Source Manager	2.3.5
		TCP/IP Links	IP Manager	2.3.5
		Remote Sites	Remote Site Manager	
		Contact Database	Contact Database	0
		Email Configuration	Email Configuration	0
		SHIP Client Users	Client-User Manager	
		GoToMyHMI Gateway	GoToMyHMI Setup	1.4.2

Figure 2-20: Designing Data Source Elements

The **Data Source Manager** maintains a database of data sources. Each data source will have a name (you provide) to identify it. In addition, you will select the communication driver and the communication link (Direct Serial, Infrared, TCP/IP to controller, or TCP/IP to InstantHMI). If the selected communication method is direct serial or infrared then you will setup the communication parameters such as baud rate, parity, data bits, and stop bits. If the communication method is

TCP/IP then you will select or create a **Device Name** that links to the IP address and Port # of the controller or InstantHMI device that originates the data.

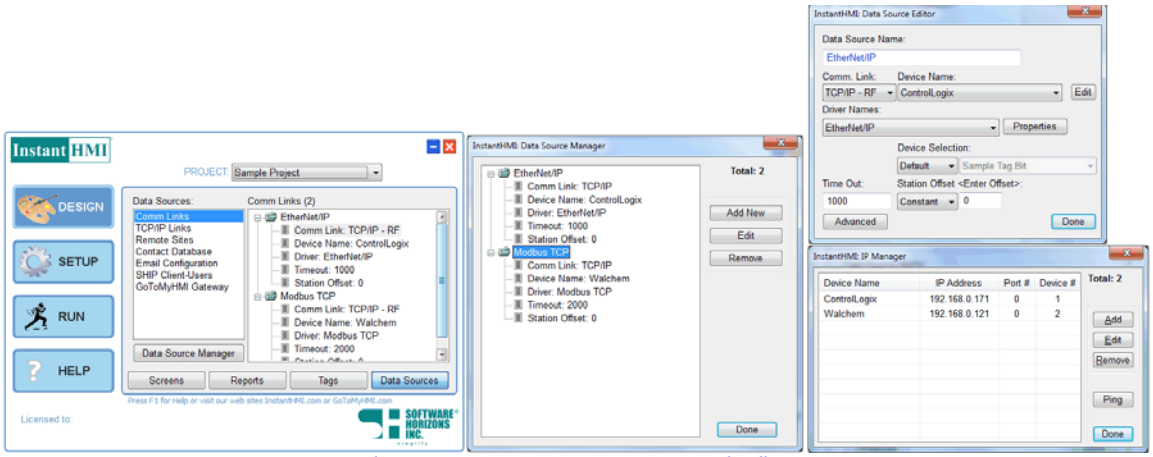


Figure 2-21: Data Source Manager and Editor

Each tag in the tag database will have a Data Source attached to it. For the active objects placed on a screen, you will be able to override the tag data source at screen creation time if you so desire. This may be necessary for projects where you want to view the same parameter on multiple controllers, where the only difference may be the IP address or station number. In the case of the station number you may use the station offset concept at the active object level. If a station offset is specified this offset will be added to the station number specified in the tag object.

InstantHMI allows access to controllers over an Ethernet LAN using wireless RF connectivity (using EtherNet/IP, Modbus TCP or other protocols involving TCP/IP which require IP addresses for the PLC or InstantHMI runtime nodes). InstantHMI makes the job of specifying IP addresses more convenient by allowing you to associate 'Device Names' to IP addresses. Only the device names will be used in Tags associated with that controller device so that if a network is reconfigured, updating the tag database is easy. All you need to do is use the **IP Manager** to reenter the changed IP address for the device name.

When assigning a target platform (PDAs, or PCs, or CE panels) to the project you will be able to specify whether the data source for each tag is Local or Remote. When the data source is Local, it will be polled by the runtime engine on the target platform; and when the data source is Remote, the tag data (for this client node) will come from another InstantHMI runtime engine on a platform (server node) identified by you.

2.4 Setup

Project **Setup** command gives access to Project Management features. These include administrative functions (such as setting up Project Users and their access privileges, Deploying Projects on target platforms), assigning project elements (such as operator Screens, Printer and Spool Reports), and setting up Special Registers for creating event-driven Printer reports, Spool reports, etc. Without Administrative privileges you will not be able to access the Project Users button and some other critical setup features. For each selected function, the Project Setup dialog reconfigures itself to display the details in panels and provides appropriately labeled function buttons to let you accomplish the desired project management objectives. All setup functions apply to the specific project selected from the pull down list of projects.

For convenient setup, project elements are grouped under four functional groups with a correspondingly labeled button:

- Project,
- Screens,
- Reports, and

- Special Tags.

For example, if you click on Setup → Project you will see the following dialog.

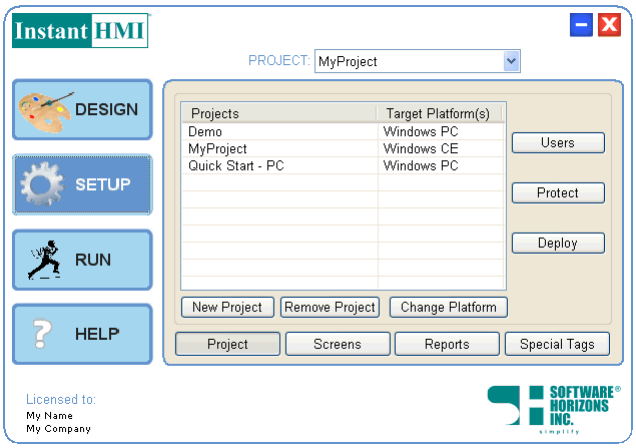


Figure 2-22: Setup → Project

The hierarchy of setup functions and the associated Project Elements as well as the Tool or Utility used in the setup are shown in Figure 2-23. Click on one of these function buttons, select a project element on the left and/or right hand panel and proceed with your setup of that project element.

Command	Functions	Project Elements	Tool or Utility	Section
Setup	Project	New Project	New Project Wizard	2.4.1
		Remove Project	Remove Project Dialog	
		Change Platform	Select Platform Dialog	
		Users	User Profile Manager	2.4.2
		Protect	Project Protection Utility	2.4.3
		Deploy	Deploy, Retrieve Dialog	2.4.4
	Screens	Project Screens	Screen Designer, Add, Insert, Remove, Delete Dialog	2.4.5
	Reports	Printer Report Templates	Report Designer, Assign, Remove, Delete Dialog	2.4.6
		Spool Reports Templates		
	Special Tags	Print Control Tags	Tag Manager Add, Remove Dialog	2.4.7
		Spool Control Tags		
		Switch Screen Tags		
		Update Enable Tags		
		Recipe Enable Tags		

Figure 2-23: Setup Functions, Associated Project Elements and Design Tools

2.4.1 Setup → Project (New, Remove, Platform)

In LaunchPad use the Project pull-down list and select <New Project> or click on Setup → Project → New Project to access the **New Project Wizard**. The wizard will guide you through the steps in creating and testing a new project. Double check cross references in this Section- copied from QSG

Step 1: Create New Project

Click on Help button for a quick review of 'Step 1: Create New Project'. When ready, click on 'Create New Project' button. This will display the 'New Project Definition' dialog.

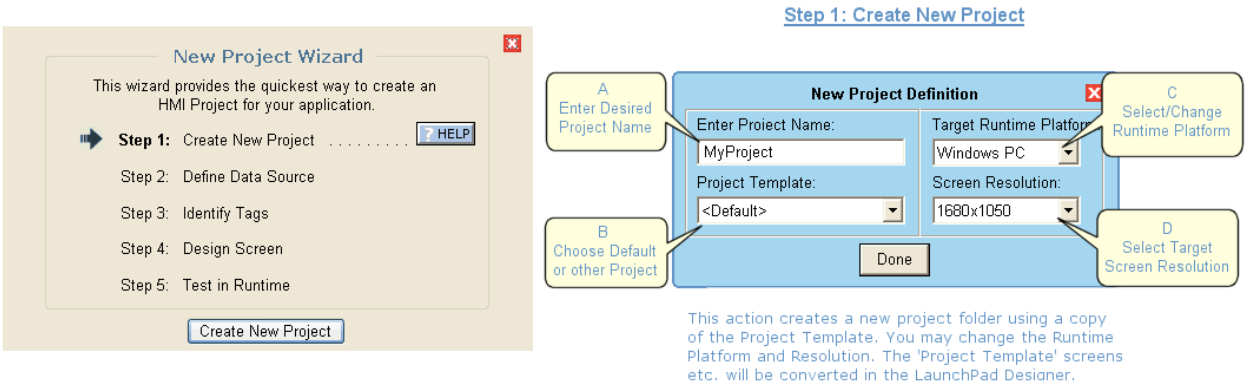

New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Create New Project
HELP
Step 2: Define Data Source
Step 3: Identify Tags
Step 4: Design Screen
Step 5: Test in Runtime
Create New Project
Step 1: Create New Project
A
Enter Desired Project Name
New Project Definition
Enter Proiect Name:
MyProject
Target Runtime Platfor
Windows PC
Project Template:
<Default>
Screen Resolution:
1680x1050
Done
C
Select/Change Runtime Platform
B
Choose Default or other Project
D
Select Target Screen Resolution
This action creates a new project folder using a copy of the Project Template. You may change the Runtime Platform and Resolution. The 'Project Template' screens etc. will be converted in the LaunchPad Designer.

Figure 2-24: New Project Wizard - Step1: Create New Project 'PLC-Comm Test'

A. Enter the desired project name (PLC-CommTest, or some other name)
B. Choose <MyProject> as Project Template to create a new project folder
C. Accept Runtime Platform inherited from the project template or change the Target Runtime Platform (Windows PC/CE/Mobile, Pocket PC, Smart Phone) using the pull-down list.
D. Accept the Screen Resolution inherited from the project template or change it to one of the available Screen Resolutions for your new project.

Click on Done button to proceed with the new project creation. The New Project Wizard will take you to the next step. Note: We will use the stub project 'MyProject' (with its simple screen and two tags) for PLC communication testing purposes using the Runtime Engine (on the Windows PC platform). The tags (variables of interest) in the project pre-created for you are tabulated below.

Tag Name	Memory Type	Data Type	Address	Bit
Register 100	Local	Int16	100	100
Bit 101	Local	Bit	0	101

Note: You may use the 'Change Platform' button to change the 'Screen Resolution' to match the screen size/resolution for a new target platform at a later date. This would be 640x480 (or higher) for desktop applications, 240x320 (or higher) for Pocket PC/ Windows CE based applications. InstantHMI implements a "*Design Once, Deploy Anywhere*" HMI solution; you may design your screens for one platform and easily convert them for use on another platform. To accomplish this, click on Setup → Project → Change Platform, switch the platform selection, and then click on Setup → Screens button (Section 2.4.5) and then re-save each of the project screens for the new platform (resolution). You may use the automatic re-saving (of screens and other selected project elements) feature built-in project protection (Section 2.4.3) to change platform and screen resolution. Simply select a simple password to protect screens, let the screens be 'protected' and re-saved. Repeat the same, resetting the password to 'no password'. Project Designer/Administrator usually deploys projects and not the operator.

Step 2: Define Data Source

You need to define a Data Source for accessing the Memory locations for the tags in your PLC. Make sure your PLC is connected to the PC running InstantHMI.

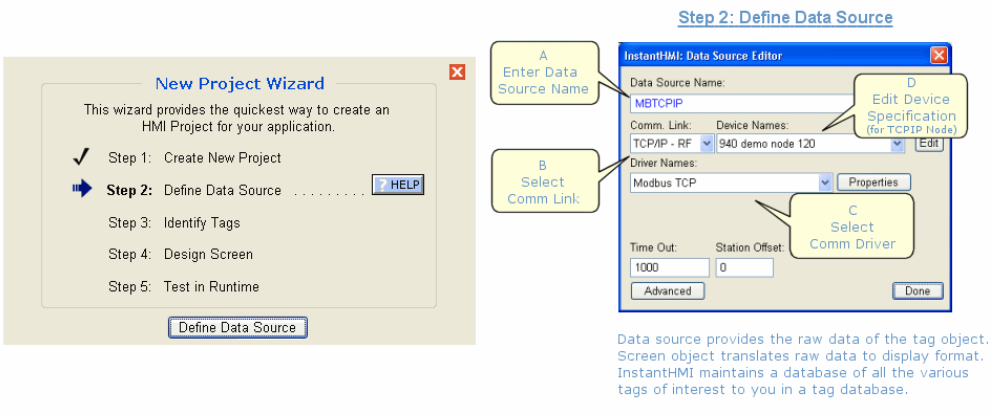

New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Create New Project
Step 2: Define Data Source
HELP
Step 3: Identify Tags
Step 4: Design Screen
Step 5: Test in Runtime
Define Data Source
Step 2: Define Data Source
A Enter Data Source Name
B Select Comm Link
C Select Comm Driver
D Edit Device Specification (for TCPIP Node)
InstantHMI: Data Source Editor
Data Source Name:
MBTCPIP
Comm. Link:
Device Names:
TCP/IP - RF
940 demo node 120
Edit
Driver Names:
Modbus TCP
Properties
Time Out:
Station Offset:
1000
0
Advanced
Done
Data source provides the raw data of the tag object.
Screen object translates raw data to display format.
InstantHMI maintains a database of all the various tags of interest to you in a tag database.

Figure 2-25: New Project Wizard - Step2: Define Data Source

Click on Help button for a quick review of 'Step 2: Define Data Source'. When ready, click on 'Data Source Manager' button.

A. Enter the new Data Source name (MBTCPIP, in our example)
B. Select Comm Link (TCP/IP-RF in our example)
C. Select Communication Driver (Modbus TCP, in our example)
D. Edit device specification (name, IP address, etc.) for TCP/IP nodes

Step 3: Identify Tags

Click on Help button for a quick review of 'Step 3: Identify Tags'. When ready, click on 'Identify Tags' button to access the Data Viewer tool, which allows you to define data blocks, identify the tags of interest in the controller and then save them to the tag database.

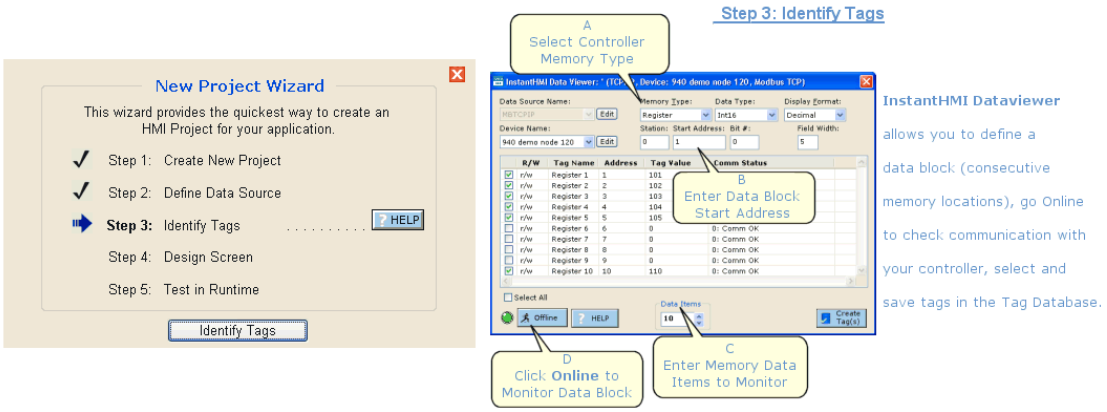

New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Create New Project
Step 2: Define Data Source
Step 3: Identify Tags
HELP
Step 4: Design Screen
Step 5: Test in Runtime
Identify Tags
Step 3: Identify Tags
A Select Controller Memory Type
B Enter Data Block Start Address
C Enter Memory Data Items to Monitor
D Click Online to Monitor Data Block
InstantHMI Dataviewer allows you to define a data block (consecutive memory locations), go Online to check communication with your controller, select and save tags in the Tag Database.

Figure 2-26: New Project Wizard - Step3: Identify Tags

Create Register memory tags as follows:

A. Select the controller memory type ('Register')
B. Enter the data block start address ('100')
C. Enter the number of data items ('1') to monitor in the Data Viewer
D. Click 'Online' button and let the Data Viewer tool retrieve and display the memory data values

Check 'Select All' and then click on 'Create Tags' to save the Register tag(s) to tag database. This will replace the previously defined tag Register 100 with your definition.

Create Bit memory tags as follows:

A. Select the controller memory type ('Bit')
B. Enter the data block start address ('101')
C. Enter the number of data items ('1') to monitor in the Data Viewer
D. Click 'Online' button and let the Data Viewer tool retrieve and display the memory data values

Check 'Select All' and then click on 'Create Tags' to save the Register tag(s) to tag database. This will replace the previously defined tag Bit 101 with your definition.

Step 4: Design Screen

Click on 'Screen Designer' button to access the Screen Designer, which allows you to create widgets and other data blocks on the screen, tie them to controller tags.

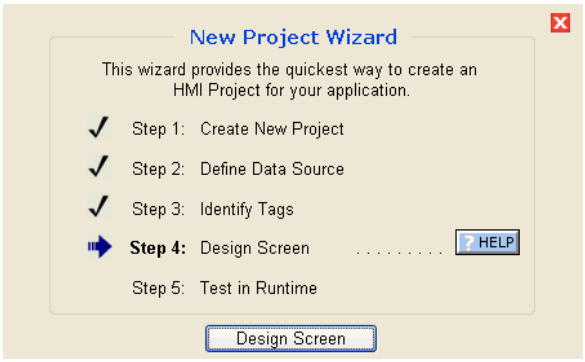

New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Create New Project
Step 2: Define Data Source
Step 3: Identify Tags
Step 4: Design Screen
HELP
Step 5: Test in Runtime
Design Screen

Figure 2-27: New Project Wizard - Step4: Design Screen

For now click on 'Skip' to skip Step 4 since we have included a Test screen for you (The two tags from Step 3 were used to replace the two tags tied to screen objects on Test Screen). You will use the Screen Designer extensively as part of the training in Quick Start Guide, Section 2.

Step 5: Test Screen in Runtime

Click on 'Runtime Engine' button, which allows you to test the screen objects tied to controller tags.

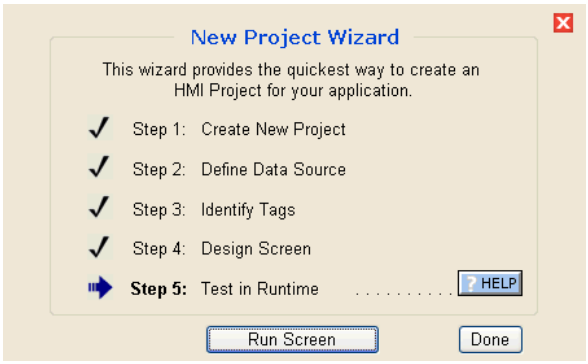

New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Create New Project
Step 2: Define Data Source
Step 3: Identify Tags
Step 4: Design Screen
Step 5: Test in Runtime
HELP
Run Screen
Done

Figure 2-28: New Project Wizard - Step5: Test Screens in Runtime

In addition to the Test Screen provided, InstantHMI creates a Watch List screen automatically for you. This screen includes all project tags in a watch list as shown below. Note: To switch from Test screen to watch list screen, right click on (an empty area of) the screen and then click Screen → Next. After reviewing the test screen and confirming PLC communications exit the InstantHMI Runtime Engine.

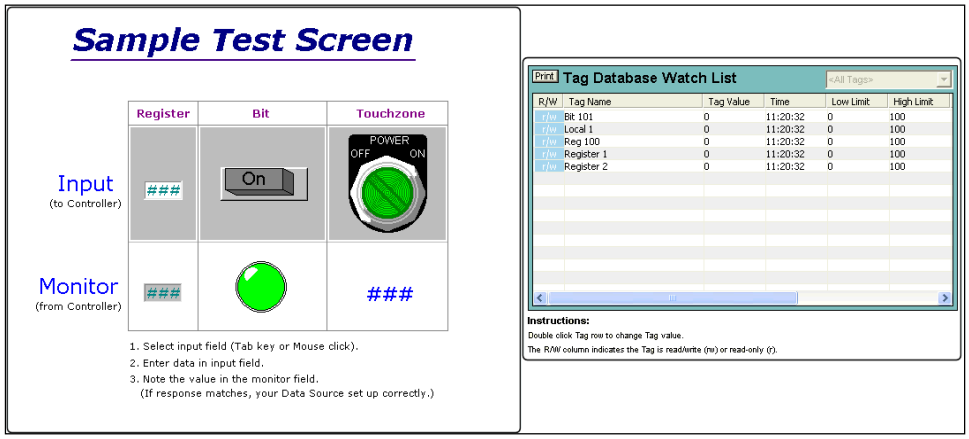


Figure 2-29: MyProject - Test Screen and Watch List Screen

Note: To remove a project, select it from the list of projects in the Setup → Project dialog (Figure 2-22) and then click on Remove Project button. To change the target runtime platform select it from

the list of projects in the Setup → Project dialog (Figure 2-22) and then click on Change Platform button.

2.4.2 Setup → Project → Users

Click on Setup → Project → Users button to access the User Profile Manager (provided you have 'User Manager Access' or you are the System Administrator). User Profile Manager allows the creation of users with different access levels such as System Integrator, Administrator, Designer, and Operator. Each user level has default properties that are assigned to that access level. You must ensure that the **Require User Login** box is checked, otherwise, no checks will be performed and the entire user password checking mechanism in InstantHMI will be disabled. This feature is provided for your convenience to turn off the password checking mechanism if it is not needed in your installation.

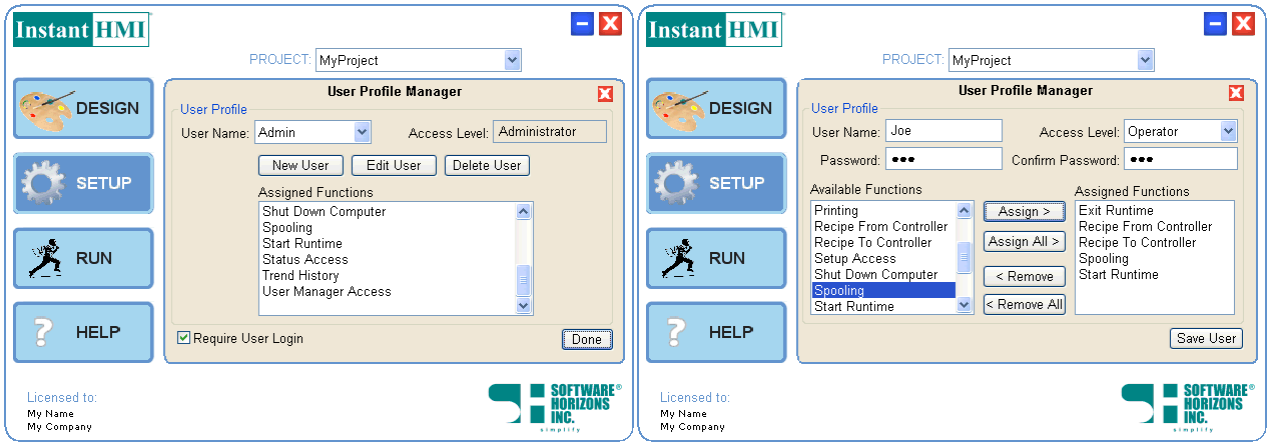


Figure 2-30: Setup → Project → Users → New User 'Operator - Joe'

To set up a new User Profile, click on **New User** button and enter a User Name. Note that User Name must be unique. Select the Access Level from the pull-down list, enter a User Password and repeat to Confirm Password. Click on one of the Available Functions (in the left panel) and then click on the **Assign** button to set up a user assigned function. Repeat until the Assigned Functions panel shows all desired functions for this user. To remove an Assigned Function, select it in the right panel and then click on the **Remove** button. For faster setup you may click on the Assign All button and selectively Remove the undesired user assigned functions. Click the **Save User** button to save the user profile in the user database (IHMI-UserDB.idb). Click the **Delete** button to delete the selected user from the user database. Click '**X**' button to Cancel (without saving) the user setup in progress. Click Done when finished setting up User Profiles.

2.4.3 Setup → Project → Protect

Benefits of Protection: Project Protection provides benefits OEMs, System Integrators, and Project Designers. InstantHMI project designers may use the Project Protection feature to prevent the end users / operators from using InstantHMI design features (such as screen modifications) that are not required to perform their tasks. This will be accomplished by disabling design features selected by the project designer for 'Project Protection'. Thus, OEMs and System Integrators will be able to design an InstantHMI project (screens, tag database, etc.) that can not be modified by their end users.

Project Protection has many beneficial aspects. It protects the end users from 'shooting themselves in the foot'. It allows OEMs and System Integrators to safeguard their own value-add project design components in InstantHMI and gain future business for application enhancements required by their customers.

OEMs may sell an OEM version of InstantHMI at a different price (higher or lower) compared to the Software Horizons published list price. If the OEM sells InstantHMI at a higher price than the Software Horizons list price (to reflect their own value-add components) the Project Protection feature will prevent their end users from purchasing InstantHMI software through Software Horizons at a lower cost, thus safeguarding the OEM

sales. Project Protection enables the OEM to sell OEM version of InstantHMI at a price lower than the Software Horizons list price (as a 'bundling promotion' with OEM's own products). End users who are not OEM customers will be unable to use OEM version of InstantHMI for non-OEM projects.

OEM Protection Mechanism: Each OEM is issued an OEM ID by Software Horizons. This OEM ID will be stored with the project to identify unique value added components from different OEMs, and also by Software Horizons. The standard version of InstantHMI will contain the Software Horizons OEM ID internally in the software. When necessary, OEMs will be provided with a specialized version of InstantHMI that will contain their OEM ID in the software. All project files created will contain the OEM ID of the software that produced them. If a project file is accessed by a program that does not have the same OEM ID, the program will deny permission to run and not allow access to that project file.

In the LaunchPad when you click on Setup → Project → Protect, the Project Protection dialog displays the current protection status of project components that may be selected to Protect/Unprotect. A checked box indicates the component is (or will be) protected.

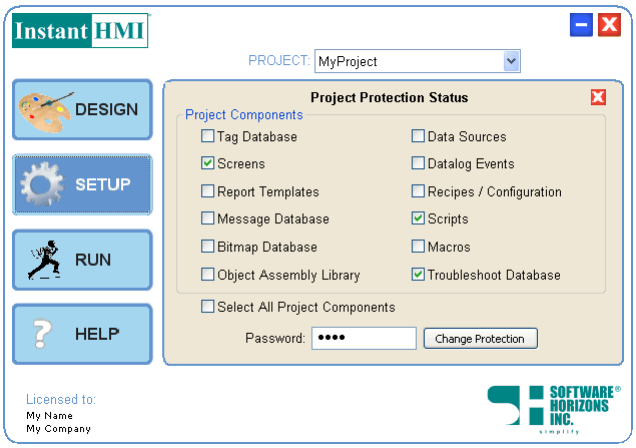


Figure 2-31: Setup → Project → Protect

An unchecked box indicates the component is (or will be) unprotected. After selecting the desired components, enter a password and click on Change Protection. (Click **'X'** to cancel, that is, leave the dialog without making any changes to component protection.) You should record this password in a safe place for any future changes to the project protection. This password will be used in all future protection schemes for this project until the project is completely unprotected.

If you have selected 'Screens' to be protected you will see the dialog box shown below. Subsequently, each screen being protected will be displayed briefly.

Figure 2-32: Screen Protection

To change the password for a protected project, you must login with the old password and unprotect it, select components to protect, enter the new password, and then protect the project again.

Note: You may use the automatic re-saving (of screens and other selected project elements) feature built-in project protection to change platform and screen resolution. Simply select a simple password to protect screens, let the screens be 'protected' and re-saved. Repeat the same resetting the password (to no password).

Forgotten Password?: If the designer (OEM or End User) should forget his project protection password, the OEM or Software Horizons (as appropriate) may be able to provide, a temporary unlocking password that will

be good for the day that it is issued. It is preferable for the designer to maintain both a protected and unprotected version of their project to avoid the need for requesting a temporary password and any applicable service charge.

Protection Verification: Among other things, an InstantHMI project includes a mandatory master protection file. A protection file must be present to run your project (whether protected or unprotected). This file includes information about the following items:

- Version of the software used for protection
- OEM ID
- Time and date of protection
- Status of project components (protected/unprotected)
- Password to protect/unprotect the project components

It is strictly recommended that no attempt be made to tamper with or modify this protection file. A corrupted protection file will render your InstantHMI installation useless as it will not be able to run any of your projects.

When running the protected project, the runtime will verify that all project components conform to the original 'protected file' state by checking the information stored in the master protection file with the information in the component files. If any project component fails the verification, the project will not be run and will produce an error code and a log file.

2.4.4 Setup → Project → Deploy

InstantHMI LaunchPad allows you to design your project on a Windows PC platform, and deploy it on any target platform such as Windows PC, or Windows CE, or PDA (Windows Mobile or Pocket PC), which has an installed InstantHMI Runtime engine. We assume you have established connectivity between the design PC and the runtime platform (see details below for various platform connectivity) before attempting to deploy the project.

If the Project you wish to deploy is different from the current project, select it from the pull-down list of projects. Click on the **Setup → Project → Deploy** button in LaunchPad. Select the Runtime Platform to Deploy to, and the Transfer Action (Deploy or Retrieve). In the 'Select Project Elements' list box select the items (such as Tag Database, Project Screens, etc.) you want to deploy to the runtime platform (Windows CE platform illustrated in Figure 2-33). Click on 'Start in Screen Mode' on the target node if desired. Finally, click on one of the two Deploy buttons (using TCP/IP or ActiveSync) to transfer the selected project elements to the target node.

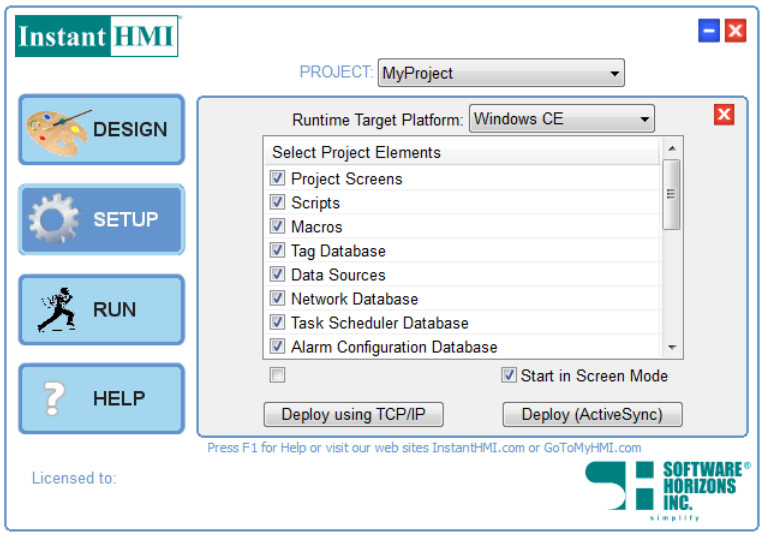


Figure 2-33: Setup → Project → Transfer → Deploy to Windows CE

Note that this feature allows you to Deploy a single master project on the Desktop PC to several target nodes.

Connectivity with Pocket PC Platform
InstantHMI uses the database synchronization feature 'Active Sync' on Pocket PC platforms to deploy projects.

Step 1. If Active Sync is not installed on your PC, do so now. ActiveSync can be downloaded from the Microsoft Website using the following link:
http://www.microsoft.com/windowsmobile/downloads/activesync38.mspx

Step 2. If ActiveSync software is running you will see the Active Sync icon in the Windows System Tray (on the bottom right of the Windows task bar which includes the Windows Start button). If not, click Start → Programs → Microsoft ActiveSync to start Active Sync, then click File → Get Connected.

Step 3. Connect the Pocket PC to your PC.

Connectivity with InstantPanel (Windows CE Panel) Platform
InstantHMI uses the database synchronization feature 'Active Sync' on Windows CE platforms to deploy projects. To Serially ActiveSync with a Windows CE Panel provided by Software Horizons, use the following instructions.

Step 1. If Active Sync is not installed on your PC, do so now. ActiveSync can be downloaded from the Microsoft Website using the following link:
http://www.microsoft.com/windowsmobile/downloads/activesync38.mspx

Step 2. Run ActiveSync on your PC, then click File → Get Connected.

Step 3. Connect COM1 (DB9 Male) on CE Panel to RS-232 on PC using adapter provided by Software Horizons.

Step 4. On PC, click Next button in ActiveSync.

Step 5. On CE Panel, Navigate to the Windows folder (My Computer -> Windows) and run REPLLOG.EXE.

Step 6. On PC – once connected, you will be prompted to create a Partnership. We recommend that you do this (as this is necessary to use Network ActiveSync later on).

Using TCP/IP to Transfer InstantHMI Project(s)
This feature is discussed in Section 11.5.5.

2.4.5 Setup → Screens

When you click on the Screens button, you will see the Available Screens for the selected project in the left panel (see Figure 2-34). Use the buttons provided (Add, Insert, and Remove) to define which screens from the Available List of screens are included in your project. In our example, the Demo project is selected and 18 screens are included in the list of Project Screens. To exclude the 'PPC-TempZone1.scr' screen from the Demo project, click to highlight and select it in the 'Project Screens' panel and then click on the Remove button. To create a new screen for the project, click on the New Screen button or click on the **Screen Designer** button.

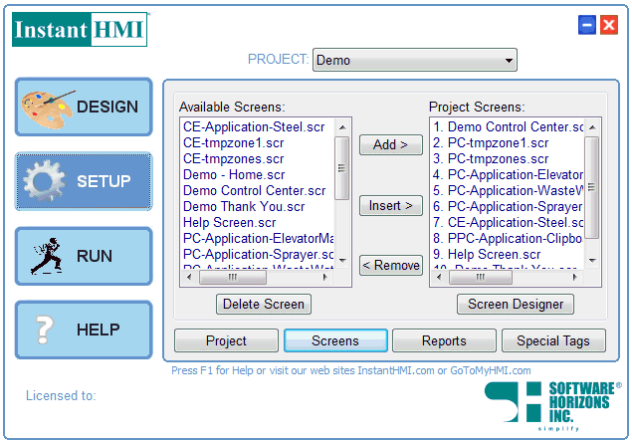


Figure 2-34: Setup → Screens

2.4.6 Setup → Reports

When you click on the Reports button, you will see the Available Reports (Printer or Spool, depending on the radio button selection) for the selected project. Use the Assign button to define which printer report (templates) is assigned to a specific printer report slot number in your project. For example, click on 'Service Log.prt' report template on the left hand panel to select it, click on slot 3 on the right panel, and then click on Assign button to make the assignment as shown (Figure 2-35).

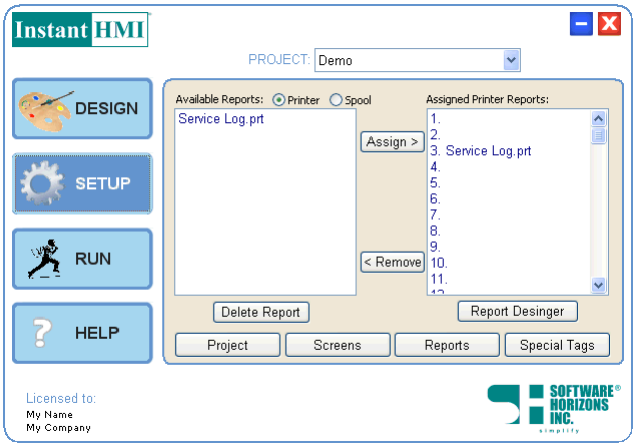


Figure 2-35: Setup → Reports → Printer

To exclude a previously assigned printer report from the project, click to highlight and select the printer report in the 'Assigned Printer Reports' panel and then click on the Remove button. To create a new printer report template for the project, click on the **Report Designer** button. Our discussion here for 'Printer Reports' applies to Spool Reports as well.

The slot number are used at Runtime to associate reports with screens. The spool and printer report templates are used by the runtime engines to produce printer and spool reports. In addition, Special Tags can be setup in the LaunchPad to generate event driven reports and logs. The LaunchPad can collect all Reports produced in the various runtime engines: Printer, Spool, Datalogs, Alarm Logs, Event Logs, System/User activity logs, etc. for later analysis.

2.4.7 Setup → Special Tags

When you click on the Special Tags button, you will see the Tags assigned to serve special tag functions (Section 9.3.3):

- Print Control,
- Spool Control,
- Switch Screen,
- Update Enable, and
- Recipe Enable.

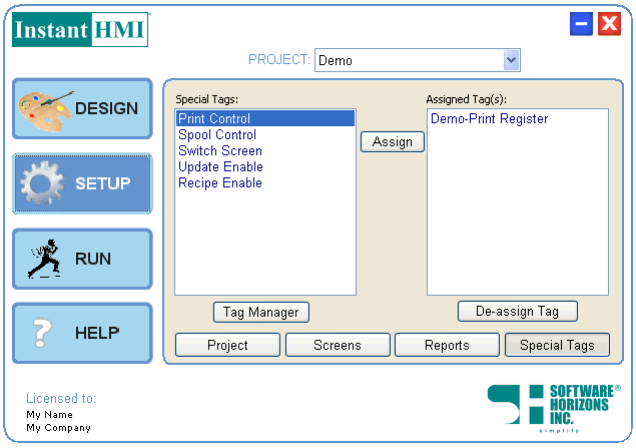


Figure 2-36: Setup → Special Tags (Print Control)

For example, the tag named 'Demo-Print Register' is assigned the Print Control special tag function. To define a special tag, click on the Special Tag function on the left hand panel (Print Control selected in Figure 2-36) and then click on 'Assign' button. This will invoke the Tag Manager to select or define associated tag(s) from the project tag database to be used to trigger printer reports included in your project. To exclude a tag from the Assigned Tags list click to highlight and select it, and then click on the De-Assign Tag button. To create a new tag (to be assigned for Print Control), click on the **Tag Manager** button.

2.5 Run

When you click on the **Run** command button, the LaunchPad displays the Splash screen for the selected project with a count down (of 10 seconds). You may now click on the Pause button to suspend auto-run of the project. At this time, you may verify Project Overview and Options before clicking on Run button to start execution of the project in the Runtime Engine. After project execution, the 'Runtime Reports' may be viewed as well. Without Runtime execution privileges you will not be able to access the Runtime Engine.

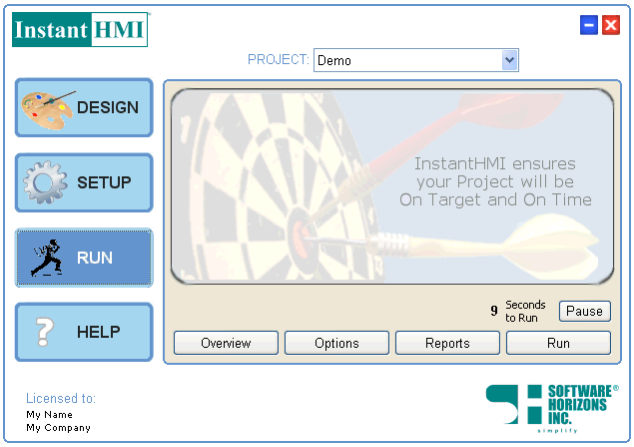


Figure 2-37: LaunchPad → Run Command - Count Down

Note: If the target platform is not a PC, you may 'Emulate' it using runtime engine on PC (if available). You may replace the image file (IHMIProjectImage.bmp) in your project folder with your own project image bitmap of same size. Likewise, IHMICompanyImage.bmp may also be replaced.

2.5.1 Project Overview

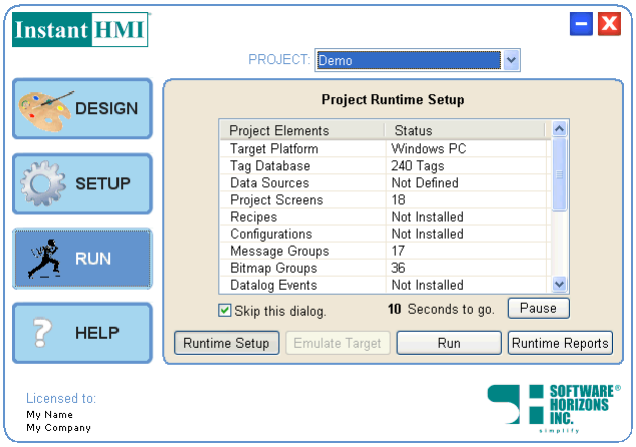


Figure 2-38: Project Runtime Overview

Click on the **Overview** button to pop-up the Project Overview dialog, which shows project elements included in your project: the number of screens in your project, the platform on which the project will be deployed, etc.

Note: You may right click on the LaunchPad and select 'Project Overview' from the pop-up menu, to display the Project Overview dialog.

2.5.2 Project Runtime Options

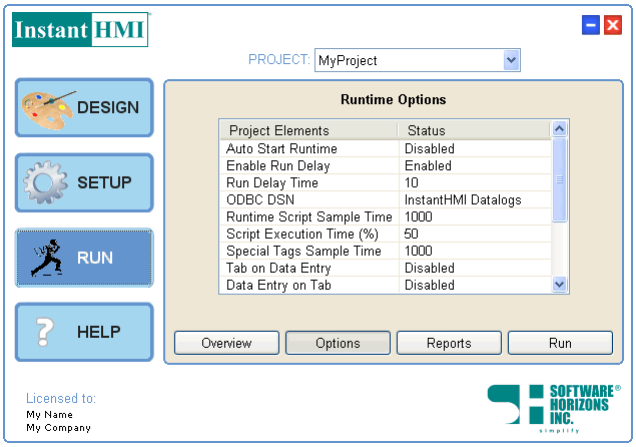


Figure 2-39: Project Runtime Options

Click on the **Options** button to pop-up the Project Runtime Options dialog, which shows project runtime parameters for your project. Double click on any of them to review and/or change its value.

Parameter Name	Parameter Key	Parameter Values	Project.ini Section
Auto Start Runtime	AUTO_START_RUNTIME	0 (Disable), 1 (Enable)	[SETUP]
Enable Multicore	MULTICORE_ENABLED	0 (Disable), 1 (Enable)	[SETUP]
Enable Run Delay	RUN_DELAY_ENABLED	0 (Disable), 1 (Enable)	[SETUP]
Run Delay Time	RUN_DELAY_TIME	10 (Sec)	[SETUP]
Project Initialization	RUNTIME_READ_ALL_SCREEN	0=First Screen Only, 1=All Screens	[SETUP]
ODBC DSN	ODBC_DSN	InstantHMI Datalogs	[SETUP]
Database Type	DATABASE_TYPE	Microsoft Access, MySQL	[SETUP]
Database Size	DATABASE_SIZE	2000 (MB)	[SETUP]
Database Backup Path	DATABASE_BACKUP_PATH	C:\IHMI-6	[SETUP]
Spool Report Folder Name	OutputFolderName	Spool Reports	[SETUP]
Print Report Folder Name	OutputFolderName	Print Reports	[SETUP]
Runtime Script Sample Time	RUNTIME_SCRIPT_SAMPLE_TIME	1000 (msec)	[IHMIRT]
Script Execution Time (%)	SCRIPT_EXEC_DURATION_PERCENT	50 (%)	[IHMIRT]
Special Tag Sample Time	SPECIAL_REG_SAMPLE_TIME	1000 (msec)	[IHMIRT]
Tab on Data Entry	AUTO_TAB	NO, YES	[IHMIRT]
Data Entry on Tab	DATA_ENTRY_ON_TAB	NO, YES	[IHMIRT]
Data Entry using QuickPad	DATAENTRY_USING_QUICKPAD	NO, YES	[IHMIRT]
Log Data Entry	LOG_DATA_ENTRY	0 (Disable), 1 (Enable)	[IHMIRT]
Report Tab Width	TABWIDTH	8	[IHMIRT]
Runtime OS Access	RUNTIME_OS_ACCESS	0= NO, 1=YES	[IHMIRT]
Title Bar	TITLEBAR_VISIBLE	0 (Disable), 1 (Enable)	[IHMIRT]
Menu Bar	MENUBAR_VISIBLE	0 (Disable), 1 (Enable)	[IHMIRT]
Allow Right Click	ALLOW_RIGHT_CLICK	0 (Disable), 1 (Enable)	[IHMIRT]
Status Bar	STATUSBAR_VISIBLE	0 (Disable), 1 (Enable)	[IHMIRT]
Multiple Monitor Support	MULTIPLE_MONITOR_SUPPORT	0 (Disable), 1 (Enable)	[IHMIRT]
Watchlist Screen	WATCHLIST_SCREEN_ENABLE	0 (Disable), 1 (Enable)	[IHMIRT]
Watchlist Update Time	WATCHLIST_SCREEN_UPDATE_TIME	1000 (msec)	[IHMIRT]
Screen Resolution	RUNTIME_RESOLUTION	0 (As Designed), 1 (Fit to Monitor)	[IHMIRT]
Retain Alarm Logs for	RETAIN_ALARM_LOGS_FOR	30 Days	[IHMIRT]
Log Comm Errors?	RUNTIME_LOGCOMMERRORS	0 (NO),1 (YES)	[IHMIRT]
Server Status	SHIP_SERVER_ENABLE	0 (Disable), 1 (Enable)	[IHMIRT]
Server Port #	SHIP_SERVER_PORT	2364	[IHMIRT]
Server Registration	SHIP_SERVER_REGISTRATION	0 (Disable), 1 (Enable)	[IHMIRT]
Server Company	SHIP_SERVER_COMPANY	Company Name	[IHMIRT]
Server Name	SHIP_SERVER_NODE	Server Name	[IHMIRT]
Date Format	DATE_FORMAT	0=mm/dd/yyyy 1=mm/dd/yy 2=dd/mm/yyyy 3=dd/mm/yy 4=yyyy/mm/dd 5=yy/mm/dd 6=yyyy/dd/mm 7=yy/dd/mm	[IHMIRT]
Time Format	TIME_FORMAT	0=HH:MM:SS 1=HH:MM 2=HH:MM:SS AM/PM 3=HH:MM AM/PM	[IHMIRT]

Note: We strongly recommend that you do not change setup parameters directly in the 'Project.ini' file to avoid unpredictable or inconsistent runtime behavior.

2.5.3 Run/Emulate Project

When you click on the **Run** button, the LaunchPad displays the Splash screen for the selected Project. The Run Function button is enabled if the Target Platform for the current project is the

Windows PC platform (on which the LaunchPad is installed). Otherwise, the RUN button will be replaced with the 'Emulate Target' button. If you are ready to run the project, click on the Run (Project) button. If your project runtime target platform is PC (and you have the Runtime Engine installed on the same PC as LaunchPad) your project will start executing under the control of the Runtime Engine. If your project runtime target platform is not the same PC as the LaunchPad, the RUN button will be replaced by the Emulate button which allows you to execute your project under the emulation of the PC Runtime Engine.

Figure 2-40: Project Execution - Splash Screen

Note: You may replace the splash file (IHMIsplash.bmp) in project folder with your own bitmap of same size.

2.5.4 Project Reports

Depending on the project setup, InstantHMI Runtime Engine will produce various reports (Printer reports, Spool reports, Alarm reports, etc.) and logs (Runtime data logs, Event logs, Communication status logs, etc.). The **Run → Reports** command on the LaunchPad displays a dialog which gives you access to the reports and logs produced by the runtime engine for the selected Project ('Demo' in the figure).

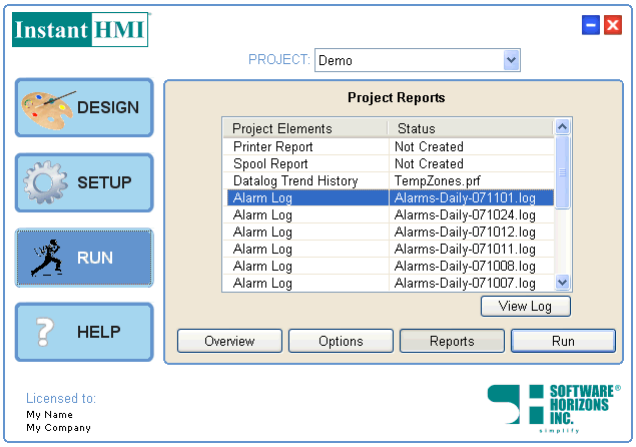


Figure 2-41: Project Runtime Reports - View Log

Click on the desired Project (Report or Log) Element to select it and click on View Report/Log button. This will open the selected report using the appropriate utility: Note Pad for text reports (logs), IHMITrend.exe to view historic trend (Section 13) data logged in any runtime engine and transferred to the LaunchPad system., etc. You may access various logs including User Event Log in InstantHMI LaunchPad and Datalogs transferred by ActiveSync from InstantHMI runs on Pocket PC nodes. (Access privilege may be needed to access some of the logs shown in the dialog box.)

Retrieving 'Datalog Data' from Pocket PC or Windows CE

Suppose your project run on the target (Pocket PC or CE) platform logged data for several tags over a period of time and you wish to retrieve the logged data (and view it in Microsoft Excel, for

example). Click on the Runtime Reports, select Datalog Data and click on Retrieve Logs button (Figure 2-41). If the target platform is properly linked to the LaunchPad PC, then the log files (for each of the tags) from the target platform will be retrieved. The log for each tag from the target platform (in its native .idb format) is appended into a single '.idb' file identified by the data retrieval date.

(Note: It is recommended you save the file to the default name and directory that is prompted. At each transfer time you will have the option to delete the previously logged data from the target platform.)

Select 'Datalog Data' and click on View Log button to access the Datalog Viewer dialog shown.

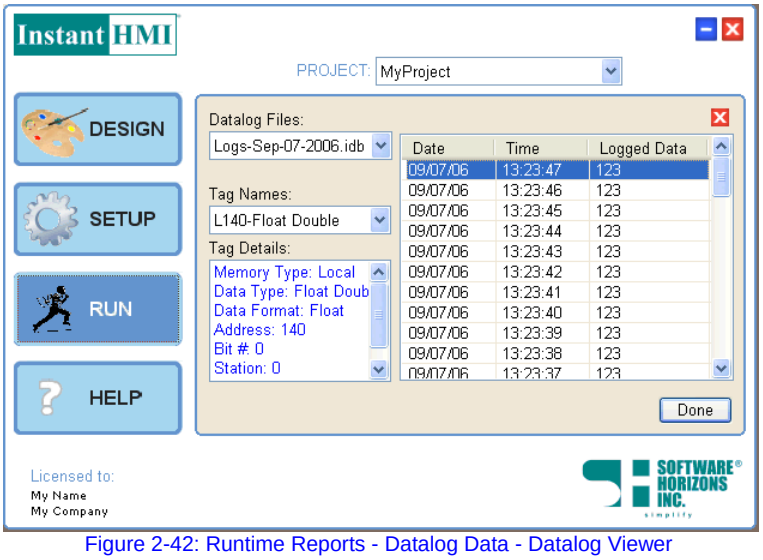


Figure 2-42: Runtime Reports - Datalog Data - Datalog Viewer

From the pull-down lists, select the Datalog File for the specific date of interest (Example: Logs-Sep-07-2006.idb) and the logged Tag Name to view. The logged data for that tag will be displayed.

How to import datalogs into Microsoft Excel (a) Run Microsoft Excel (b) File → Open → C:\IHMI-6\'Project Name'\Datalogs\Logs-Month-DD-YYYY.txt (c) In the text import wizard, (after making sure you allow 'All Files' to be selected), select Delimited and Click Next, select comma and Click Next, and select column data formats as appropriate and click Finish. (d) File → Save and Exit Excel.

For your convenience, the .idb file on the PC is automatically transferred to a comma separated text file for easy import into Microsoft Excel.

NOTE: InstantHMI Historic Trending utility must be installed and properly configured (including defining an ODBC data source name - Section 13) before you can successfully transfer data to an ODBC database.

Click on the **'Transfer Logs to ODBC'** button to convert the data to an ODBC database, which is compatible with several analysis programs (including InstantHMI Historic Trend Utility discussed in Section 13). Since data may be logged on several different platforms running InstantHMI, it is important to identify the runtime-node where the data was logged. For this purpose, you will see a 'Datalog Association' Dialog to flag the logged data with a 'Runtime Node Name'. You can use data selected from one or more runtime nodes for trending purposes (see Section 13.3).

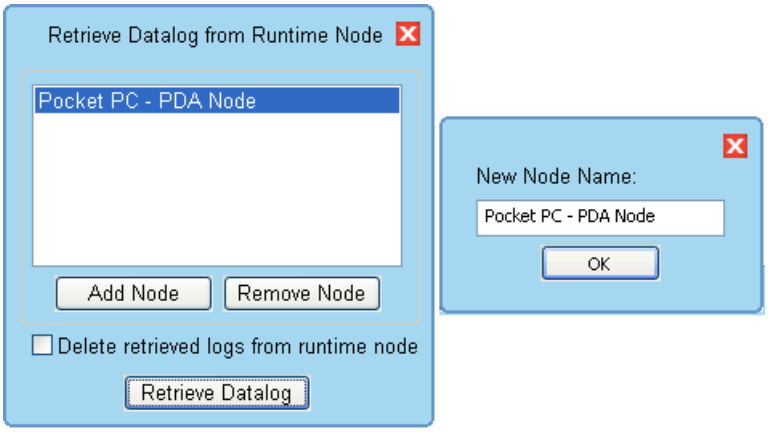


Figure 2-43: Database User Dialog Use a Different ID name

Create 'New Node Name' or select a previously defined node name and click Start Transfer. The logged data from the .idb file will be transferred into the ODBC database (.MDB) identified in the ODBC DSN setup.

2.6 Exit

Click on **'X'** button on LaunchPad to access the Exit dialog (under password control):

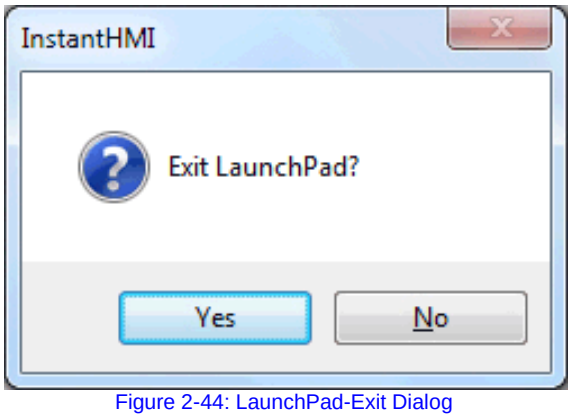


Figure 2-44: LaunchPad-Exit Dialog

2.7 Mini-LaunchPad (InstantHMI LaunchPad for CE)

In Sections 2.1 - 2.6 we described how the InstantHMI Project design and setup are done using the LaunchPad Development System (running on a PC platform). The projects are then deployed to the target platforms. Starting with version 6.1.26, we have made the CE Runtime functionally as close to PC Runtime as possible and for your convenience, we have incorporated a Mini- LaunchPad for the CE platform, which provides the essential Design elements (such as Data Source editing to select/change driver parameters, etc.) but not the detailed design tools (such as Screen Designer, Macro Editor etc.). This section describes the available functionality in the Mini-LaunchPad for CE Platform. Note that all available functionality of the Mini-LaunchPad mimics the corresponding functionality of the LaunchPad described in Sections 2.1 - 2.6.

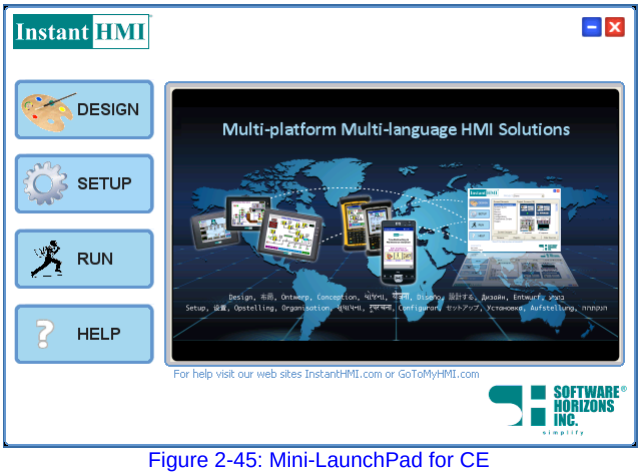


Figure 2-45: Mini-LaunchPad for CE

Note: Unlike the LaunchPad (for PC platform), the Mini-LaunchPad (for CE platform) supports only a single project designed on the PC platform (you might notice the missing pull-down list for Project selection at the top). However, you may copy and maintain multiple projects on the CE platform in their own project folders. The folder named 'Project' must exist under the installation folder 'InstantHMI' on the CE platform and the active project files must be present in this 'Project' folder on the CE platform. You may maintain other projects (inactive) in their own named folders and use them to replace the contents of 'Project' folder for testing.

2.7.1 Help

The LaunchPad **Help** command displays program version information (Figure 2-4) and also provides one buttons: Register/Activate. Note: If you double click the Runtime Engine or LaunchPad items on this panel, the OEM acronym will be displayed. Standard is displayed for the standard version meant for all non-OEM customers.

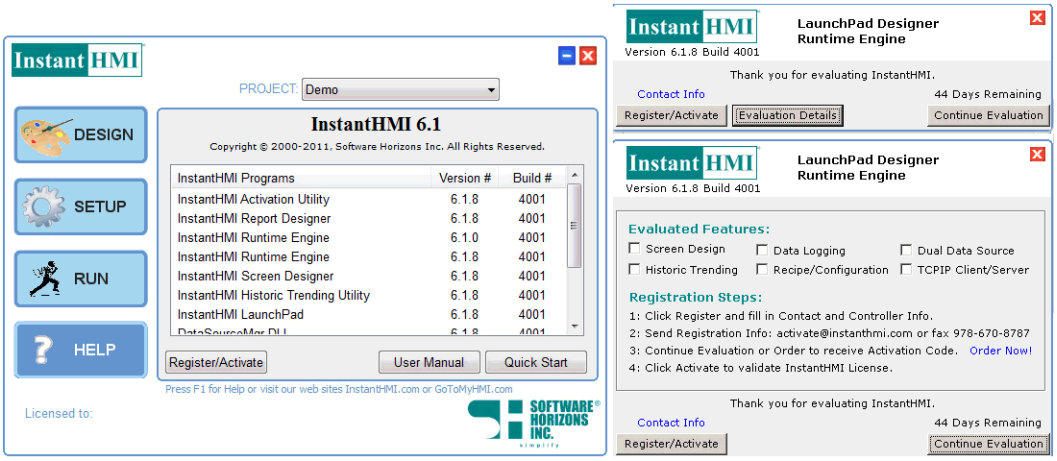


Figure 2-46: LaunchPad → Help

The **Register/Activate** button allows you to create Registration information to be sent to Software Horizons. Registration is required to receive your license activation (after your InstantHMI software order or to request an evaluation before you order). The **Order Help** button presents additional information to help you. (This button will disappear once you have Activated your license.) Activation is essential to access all the installed features in your InstantHMI software (Appendix A).

2.7.2 Design

Design → Screens

This functionality of the Mini-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.1. However, the Screen Designer tool is available only on the PC platform

and the screens must be designed in the LaunchPad on the PC platform and then deployed to the CE platform.

Design → Screen → Troubleshoot Scripts
This functionality of the Mini-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.2. However, the Troubleshoot Editor tool is available only on the PC platform and the Troubleshoot scripts must be designed in the LaunchPad on the PC platform and then deployed to the CE platform.

Design → Reports
This functionality of the Mini-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.3. However, the Report Designer tool is available only on the PC platform and the report templates must be designed in the LaunchPad on the PC platform and then deployed to the CE platform.

Design → Tags
This functionality of the Mini-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.4. However, the Tag Editor tool is available only on the PC platform and the Tag Database must be designed in the LaunchPad on the PC platform and then deployed to the CE platform.

Design → Data Sources
This functionality of the Mini-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.5. The Data Source Manager is also available on the CE platform so you can make changes to the Data Source designed in the LaunchPad on the PC platform and then deployed to the CE platform.

2.7.3 Setup

Project **Setup** feature is the exclusive domain of PC LaunchPad and this feature is not supported on the CE platform.

2.7.4 Run

This functionality of the Mini-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.5.

2.7.5 Exit

Click on **'X'** button on Mini-LaunchPad to access the Exit dialog (under password control).

2.8 Micro-LaunchPad (InstantHMI LaunchPad for PDA)

In Sections 2.1 - 2.6 we described how the InstantHMI Project design and setup are done using the LaunchPad Development System (running on a PC platform). The projects are then deployed to the target platforms: PC/CE/PDA. Starting with version 6.1.26, we have made the CE/PDA Runtime functionally as close to PC Runtime as possible. We described the Mini-LaunchPad for the CE platform in Section 2.7. The Micro-LaunchPad for the PDA platform provides the essential Design elements (such as Data Source editing to select/change driver parameters, etc.) but not the detailed design tools (such as Screen Designer, Macro Editor etc.). This section describes the available functionality in the Micro-LaunchPad for PDA Platform.

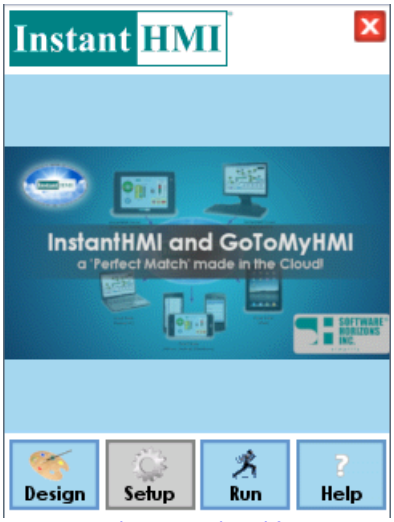


Figure 2-47: Micro-LaunchPad for PDA

Note: Like the Mini-LaunchPad (for CE platform), the Micro-LaunchPad (for PDA platform) supports only a single project designed on the PC platform (you might notice the missing pull-down list for Project selection at the top). However, you may copy and maintain multiple projects on the PDA platform in their own project folders. The folder named 'Project' must exist under the installation folder 'InstantHMI' on the PDA platform and the active project files must be present in this 'Project' folder on the PDA platform. You may maintain other projects (inactive) in their own named folders and use them to replace the contents of 'Project' folder for testing.

Note that all available functionality of the Micro-LaunchPad mimics the corresponding functionality of the LaunchPad described in Sections 2.1 - 2.6. To accommodate the PDA form-factor, the four Command buttons (Design, Setup, Run and Help) are laid out at the bottom, the Function buttons are replaced by a Function pull-down list at the top, and the Project Elements buttons are replaced by an Elements pull-down list below the Function pull-down list. The hierarchy (Command →Function →Elements) is easy to follow to access the specific design elements.

2.8.1 Help

The LaunchPad **Help** command displays program version information (Figure 2-4) and also provides one buttons: Register/Activate. Note: If you double click the Runtime Engine or LaunchPad items on this panel, the OEM acronym will be displayed. Standard is displayed for the standard version meant for all non-OEM customers.

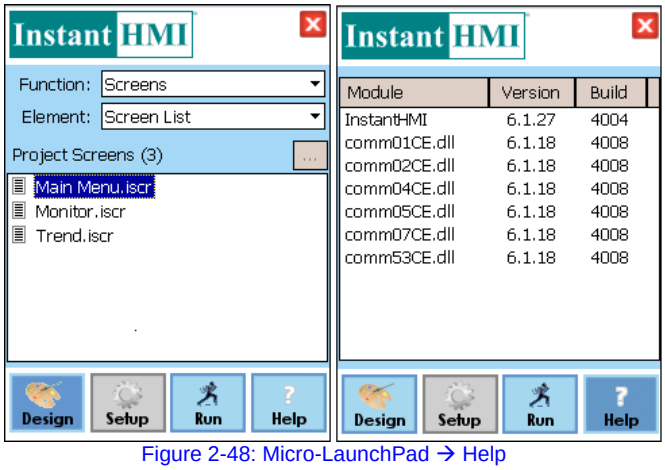


Figure 2-48: Micro-LaunchPad → Help

The **Register/Activate** button allows you to create Registration information to be sent to Software Horizons. Registration is required to receive your license activation to access all the installed features in your InstantHMI software (Appendix A).

2.8.2 Design

Design → Screens

This functionality of the Micro-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.1.

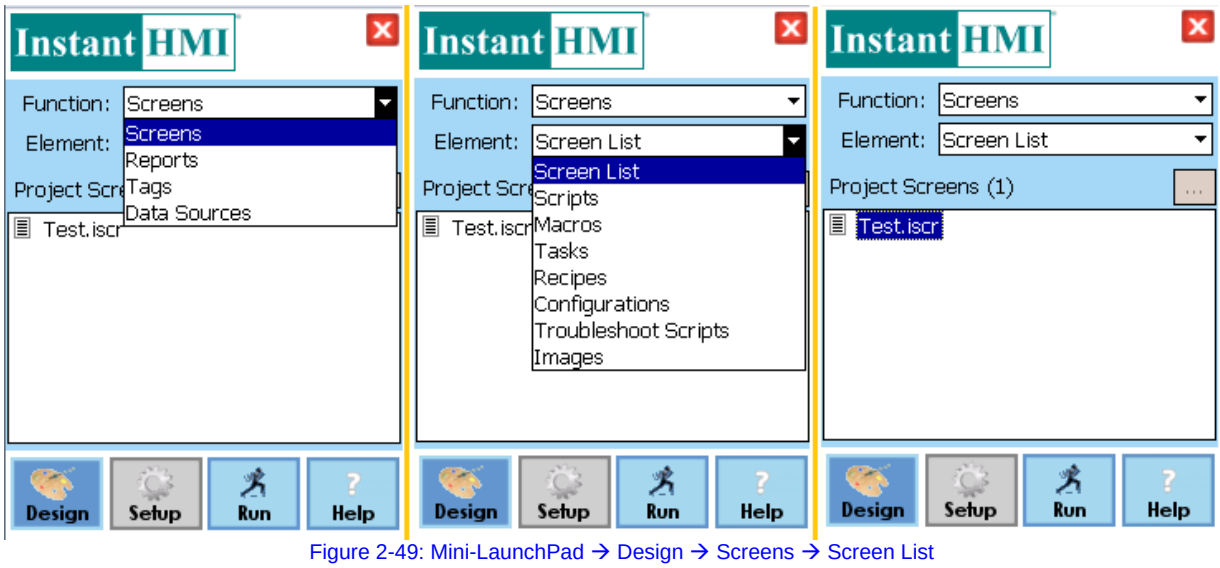


Figure 2-49: Mini-LaunchPad → Design → Screens → Screen List

To see the Screens included in the Project tap on the 'Design' command button and then select the Function 'Screens'. Then you may select any available Element for the Screen (example shown: Screen List).

Note: the Screen Designer tool is available only on the PC platform and screens must be designed in the LaunchPad on the PC platform and then deployed to the PDA.

Design → Screen → Troubleshoot Scripts

This functionality of the Micro-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.2. However, the Troubleshoot Editor tool is available only on the PC platform and the Troubleshoot scripts must be designed in the LaunchPad on the PC platform and then deployed to the PDA platform.

Design → Reports

This functionality of the Micro-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.3. However, the Report Designer tool is available only on the PC platform and the report templates must be designed in the LaunchPad on the PC platform and then deployed to the CE platform.

Design → Tags

This functionality of the Micro-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.4. However, the Tag Editor tool is available only on the PC platform and the Tag Database must be designed in the LaunchPad on the PC platform and then deployed to the PDA platform.

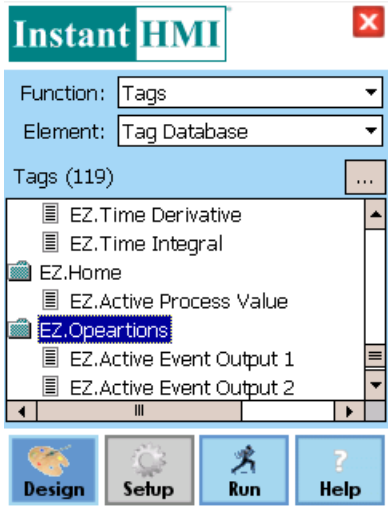


Figure 2-50: Micro-LaunchPad TagDatabase

Each tag in the tag database will have a Data Source attached to it.

Design → Data Sources

This functionality of the Micro-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.3.5.

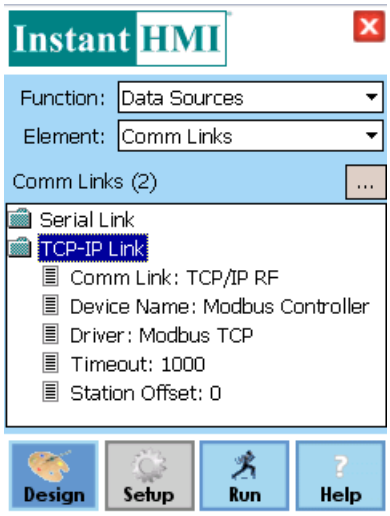


Figure 2-51: Micro-LaunchPad→ Design→ Data Sources

The Data Source Manager is also available on the PDA platform so you can make changes to the Data Source designed in the LaunchPad on the PC platform and then deployed to the PDA platform. Click on the '…' button to access the Data source Manager.

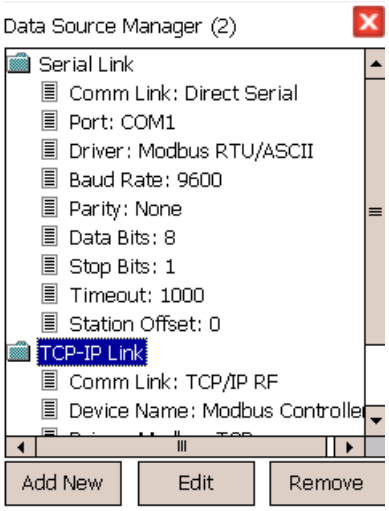


Figure 2-52: Micro-LaunchPad - Data Source Manager

Select the Comm Link (TCP-IP Link, in our example) and tap on Edit to access the Data Source Editor.

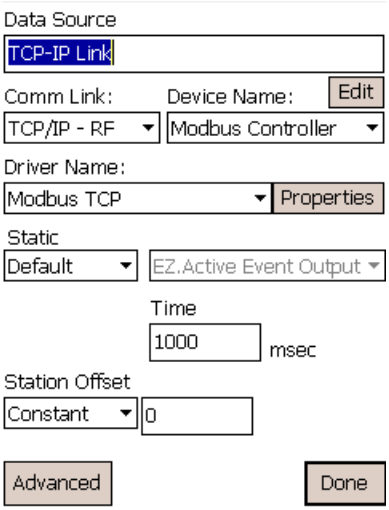


Figure 2-53: Micro-LaunchPad - Data Source Editor

Here you may select the Driver Name and its Properties by clicking on the Properties button.

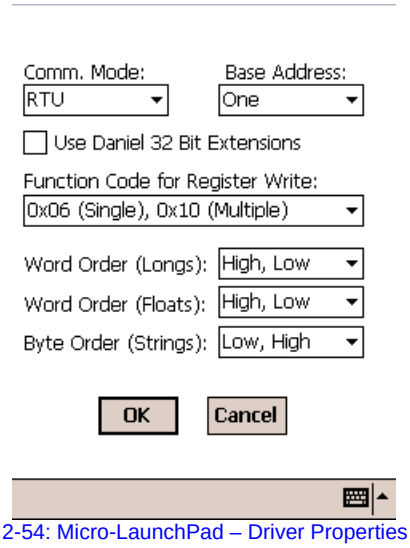


Figure 2-54: Micro-LaunchPad – Driver Properties

After setting up the Data Source the way you want click on OK, Done etc. to return to the Mini-LaunchPad.

2.8.3 Setup

Project **Setup** feature is the exclusive domain of PC LaunchPad and this feature is not supported on the PDA platform.

2.8.4 Run

This functionality of the Micro-LaunchPad mimics the corresponding functionality of the LaunchPad described in Section 2.5.

2.8.5 Exit

Click on **'X'** button on Micro-LaunchPad to access the Exit dialog (under password control).

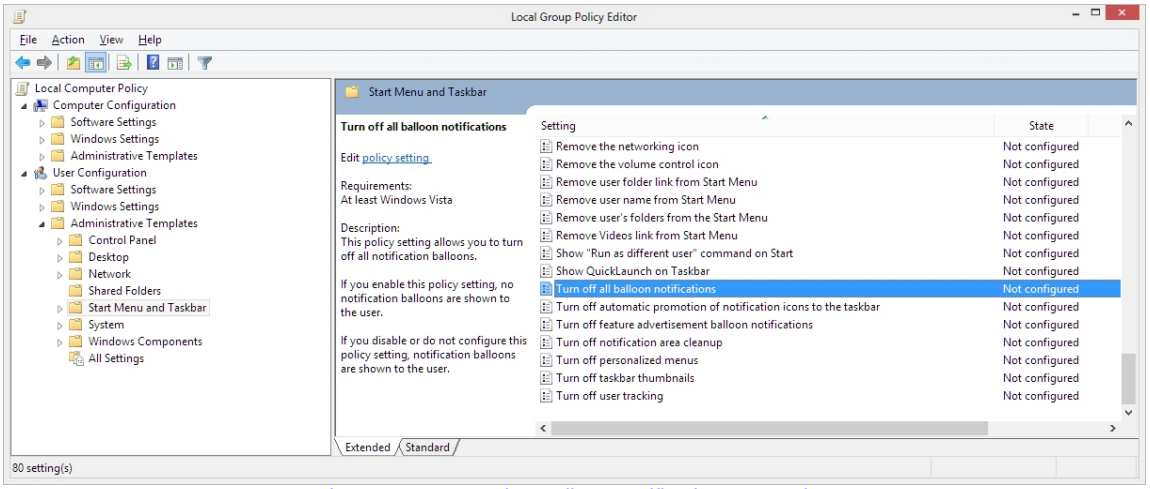
2.9 Windows OS Access Control from Runtime

InstantHMI Runtime option parameter, 'Runtime OS Access' when enabled restricts access to the OS from the Runtime.

All window key combinations, alt + tab, and ctrl + escape are being discarded, minimize/restore functions not allowed, and taskbar is hidden when this option is **disabled**.

Additionally, since Ctrl-Alt-Del and the Task Bar notifications are handled by the OS at a lower level, you may do the following:

Windows 7 Professional
Use the Group Policy Editor (gpedit.msc) to configure how Windows behaves. Setting Remove Task Manager to Enabled and setting Turn off all balloon notifications to enabled should give you the desired behavior.


Local Group Policy Editor
File Action View Help
Local Computer Policy
Computer Configuration
Software Settings
Windows Settings
Administrative Templates
User Configuration
Software Settings
Windows Settings
Administrative Templates
Control Panel
Desktop
Network
Shared Folders
Start Menu and Taskbar
System
Windows Components
All Settings
Start Menu and Taskbar
Turn off all balloon notifications
Edit policy setting
Requirements:
At least Windows Vista
Description:
This policy setting allows you to turn off all notification balloons.
If you enable this policy setting, no notification balloons are shown to the user.
If you disable or do not configure this policy setting, notification balloons are shown to the user.
Setting
State
Remove the networking icon Not configured
Remove the volume control icon Not configured
Remove user folder link from Start Menu Not configured
Remove user name from Start Menu Not configured
Remove user's folders from the Start Menu Not configured
Remove Videos link from Start Menu Not configured
Show "Run as different user" command on Start Not configured
Show QuickLaunch on Taskbar Not configured
Turn off all balloon notifications Not configured
Turn off automatic promotion of notification icons to the taskbar Not configured
Turn off feature advertisement balloon notifications Not configured
Turn off notification area cleanup Not configured
Turn off personalized menus Not configured
Turn off taskbar thumbnails Not configured
Turn off user tracking Not configured
Extended Standard
80 setting(s)
Figure 2-55: Removing Balloon Notifications on Task Bar

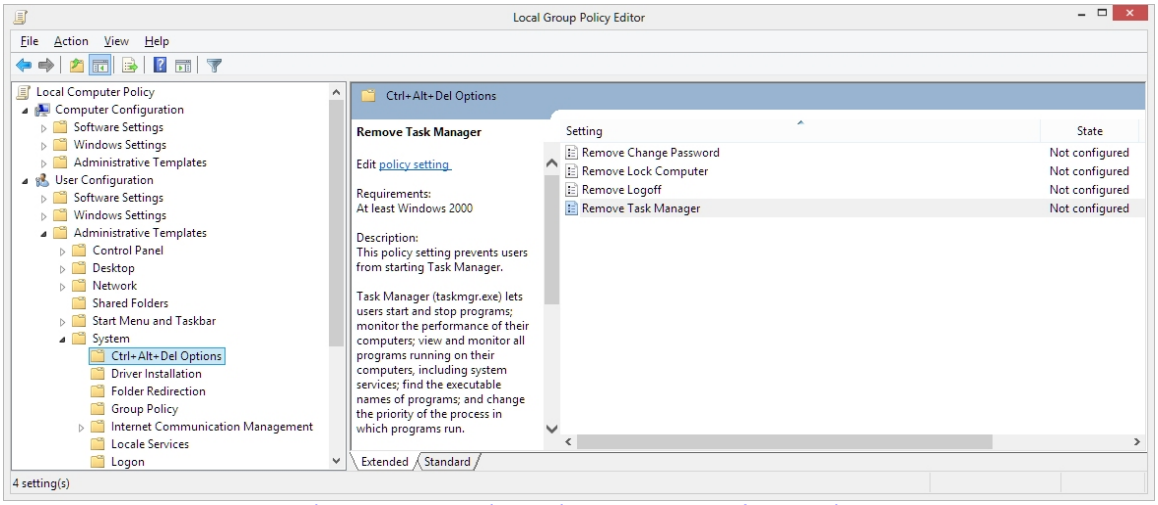


Figure 2-56: Removing Task Manager Access from Runtime

Windows 7 Home

If you are thoroughly familiar with Registry editing, manually configure the registry (using Regedit). Caution: Please backup your registry before making any changes. These changes should only be made by someone who is familiar with Regedit and the registry to avoid compromising system integrity.

Under [HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer]
Add **TaskbarNoNotification** as a dword
Set the value to 1

Under [HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Policies\System]
Add **DisableTaskMgr** as a dword
Set the value to 1

Delete value **TaskbarNoNotification** from
[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\Explorer]

Delete value **EnableBalloonTips** from
[HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\Advanced]

Delete value **EnableBalloonTips** from
[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer\Advanced]

3 Databases

An InstantHMI Project implements the 'model of the Process or Machine Control Application' for the benefit of operators, supervisors and management who are responsible for the proper and efficient operation of the machine and the plant. Your project design may include numerous data items, bitmaps, text messages, etc. which are organized and stored in several databases as shown in the table below.

Database Name	Contents and Purpose	Output From	See Section
IHMI-TagDB.idb	All Tag groups and Tag definitions	PC Designer & PPC/CE Runtime	Section 3.2, 3.3
IHMI-MessageDB.idb	All message groups and messages	PC Designer & PPC/CE Runtime	Section 3.4
IHMI-RecipeDB.idb	Recipe definitions and saved recipes	PC Designer & All Runtimes	Section 3.6
IHMI-ConfigDB.idb	Configuration definitions and saved configurations	PC Designer & All Runtimes	Section 3.6
IHMI-ImageDB.idb	Bitmap Groups and bitmap names in the group	PC Designer	Section 3.5
IHMI-DataSourceDB.idb	Data Source Definitions	PC Designer & PPC/CE Runtime	Section 3.1
IHMI-DatalogDB.idb	Datalogs	PPC/CE Runtime	
IHMI-NetworkDB.idb	Device Name associations with IP Addresses	PC Designer & PPC/CE Runtime	Section 3.1
IHMI-ScanHistoryDB.idb	Barcode scan history	PPC/CE Runtime	
IHMI-TroubleshootDB.idb	Troubleshoot scripts	PC Designer	Section 2.3.2
IHMI-DatalogEventsDB.idb	Events to trigger datalogging	PC Designer & PPC/CE Runtime	Section 3.7
IHMI-ProtectionDB.idb	Master data about protected projects to determine the projects validity	PC Designer	Section 2.4.3
IHMI-UsersDB.idb	Username/passwords of users and their properties	PC Designer	Section 2.4.2
IHMI-MacroDB.idb	Project/screen macro definitions for use at runtime	PC Designer	Section 6.3
IHMI-SettingsDB.idb	Copy of registry settings	PPC/CE Runtime	
IHMI-SystemDB.idb	PPC/CE Security information	PPC/CE Runtime	
IHMI-PreferenceDB.idb	Selected communication settings (Data Source, etc), Preformatted screen settings, Bar Graph settings, Bar Code settings, Memory Viewer settings, and username/password	PPC/CE Runtime	
IHMI-ModemDB.idb	Telephone numbers and modem initialization strings	PC Designer	
IHMI-ObjectAssembly.idb	Object assemblies	PC Designer	
IHMI-DeviceDB.idb	Device status information based on Data Source, Net Device Name, & Station ID	PC Runtime	OEM Application
IHMI-ServerDB.idb	SHIP Username/passwords	PC Designer	
IHMI-AlarmsConfigDB.idb	Alarm Configurations of tags	PC Designer	
IHMI-EmailConfigDB.idb	Email address, Outgoing/Incoming mail server	PC Designer	
IHMI-ContactsDB.idb	Persons who receive the email from HMI-Server	PC Designer	
IHMI-ScheduleDB.idb	Persons who receive the email from HMI-Server	PC Designer	Task Scheduler

Depending on your design, some of the databases may not have any relevant information for your specific HMI application solution. In general, the information for Monitoring and Control of your

machine/process is presented using display data objects on project screens. These display data objects get their parameters from a tag object in the Tag Database. The data source for the tag provides the *raw data* of the tag object. The screen object then translates the raw data into the chosen *display format* of the screen object. InstantHMI maintains a database of all the various raw data information items ('tags') of interest to you in a tag database. For convenience, the tags may be assigned to one or more named tag groups. All the tags assigned to a tag group can be monitored on a preformatted Data Monitor Screen on a PDA (Section **Error! Reference source not found.**) or on project screens designed by you. Special tag groups for Recipes and Alarms are also available. Tags may also be used to represent messages from Message Groups and to display a bitmap from Bitmap Groups on the screen. Finally, tags may be automatically and implicitly associated with a Data Table representing arrays of memory locations from your controller. The databases resident in PDAs (Windows Mobile or Pocket PC) and Windows CE platforms may differ in format from the corresponding PC versions. In InstantHMI you would design and maintain the project databases using the Tag Manager and Screen Designer in the LaunchPad. However, for your convenience, some utilities are available in InstantHMI to manage/edit databases on the target platforms (such as PDAs), and in such cases we have included a discussion of them along with the corresponding Tag Manager/Editor and other utilities available in the LaunchPad for PC platform.

3.1 Data Sources

In Screen Designer, click on Tag Data → Data Sources to access the **Data Source Manager**, which maintains a database of data sources. Note: You may also click on LaunchPad → Data Sources → Comm Links, select a data source from the pre-view panel and then click on Data Source Manager button). Each data source will have a name (you provide) to identify it. In addition, you will select the communication driver and the communication link (Direct Serial, Infrared, OPC Server, TCP/IP to controller, or TCP/IP to InstantHMI). If the selected communication method is direct serial or infrared then you will setup the communication parameters such as baud rate, parity, data bits, and stop bits. If the communication method is TCP/IP then you will select or create a **Device** that links to the IP address and Port # of the controller or InstantHMI device that originates the data.

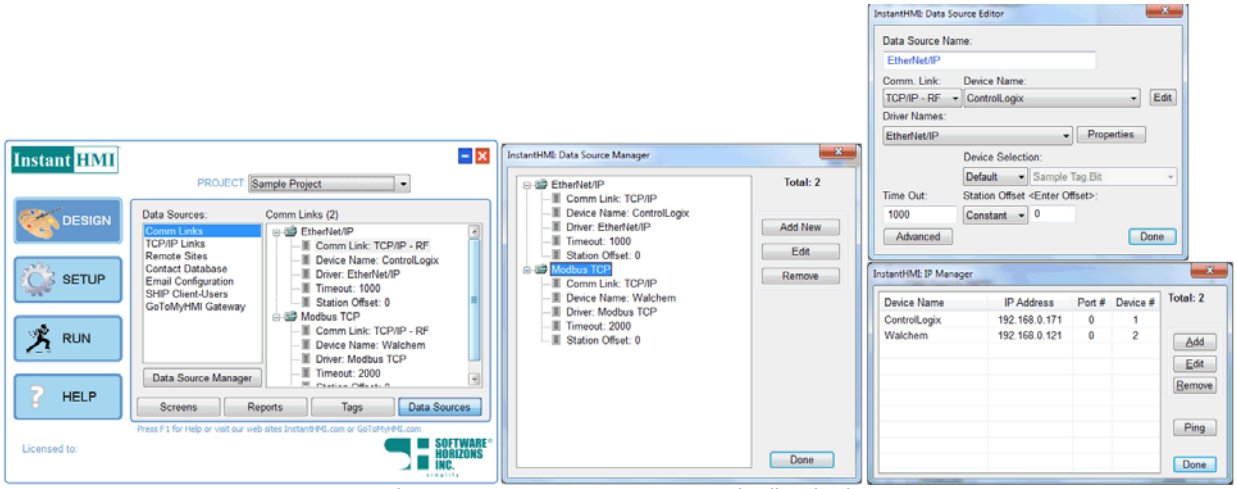


Figure 3-1: Data Source Manager and Editor (PC)

Each tag in the tag database will have a Data Source attached to it. For the active objects placed on a screen, you will be able to override the tag data source at screen creation time if you so desire. This may be necessary for projects where you want to view the same parameter on multiple controllers, where the only difference may be the IP address or station number. In the case of the station number you may use the station offset concept at the active object level. If a station offset is specified this offset will be added to the station number specified in the tag object.

InstantHMI allows access to controllers over an Ethernet LAN using wireless RF connectivity (using Modbus TCP or other protocols involving TCP/IP which require IP addresses for the PLC or InstantHMI runtime nodes). InstantHMI makes the job of specifying IP addresses more convenient

by allowing you to associate 'Device Names' to IP addresses. Only the device names will be used in Tags associated with that controller device. All you need to do is use the **IP Manager** to reenter the changed IP address for the device name.

Click on **Edit** button next to Device Names in the Data Source Editor to specify a Device Name and associated IP address. Use the IP Manager to manage the list of device names and their associated IP addresses. Click on the **Add** button to enter a new device name and its IP address. Click on **Done** to exit the IP Manager.

The Data Source Manager discussed above applies to PDAs as well. The screens for Data Source IP Manager are shown below.

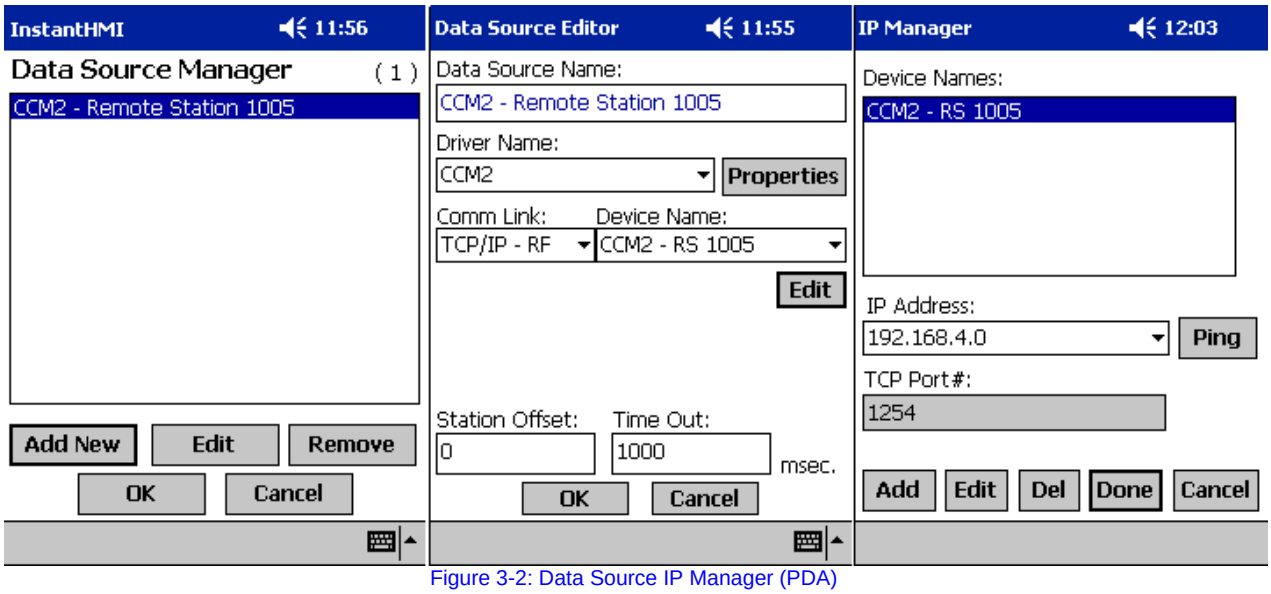


Figure 3-2: Data Source IP Manager (PDA)

InstantHMI allows access to Controllers over an RF link using Ethernet and / or serial adapter modules available as an RF-kit from Software Horizons Inc. Wireless RF connectivity (using Modbus TCP or other protocols) involves TCP/IP in most cases which in turn requires IP addresses for the Controller nodes.

You may access the IP manager screen through the Data Source editor or through the InstantHMI Menu Screen **(Tag Variables → IP Manager)**. InstantHMI makes the job of specifying IP addresses more convenient by allowing you to associate 'Device Names' to IP addresses. Only the device names will be used in Tags associated with that Controller device. If the IP address for a Controller node is changed, all you need to do is use the IP editor to reenter the changed IP address for the Controller device name. All the tags for the Controller remain unchanged.

Tap the **Add** button to add a new device name. Tap the **Delete** button to delete a selected device name or tap the **Edit** button to change the device's IP Address. Tap on **Done** button to exit the IP Manager.

Note: You may use Dynamic Device Name (IP) changes (via Local/Register Memory) to avoid End-Users having to go into Data Source Setup.

3.2 Data Table Viewer

Click on LaunchPad → Tags → Data Viewer (or in Screen Designer click on Tag Data → Data Viewer) to access the **Data Viewer tool**, to rapidly verify communications with controller memory of interest, display the data from these memory locations in a tabular form, and transfer the automatically created tags for these memory locations to the Tag Database. Use the Watch List in InstantHMI Runtime to monitor tag groups (controller memory of interest) in a tabular form.

3.2.1 Data Viewer (PC)

The Data Viewer tool allows you to define data blocks, identify the tags of interest in the controller and then save them to the tag database. The data viewer tool is an integral part of the new project wizard (Section 2.4.1). To use the data table viewer, you define a data block as follows: select a Data Source (and a Device Name if appropriate), select a Memory Type and enter the Station number, Start Address and the number of consecutive data items. You may also select the Data Type and Display Format and enter the display Field Width as appropriate (see Section 4.11 for details). (We have illustrated Data Table Viewer for Register Memory, with a Data Source and Device Name selected). The automatically created tag names (Register 1, Register 2, …) appear in the Tag Name column. Click on 'Go Online' button to monitor the tag data values. The LED widget will blink each time the table is updated. The Comm Status for each tag is also indicated. Before saving the automatically created tags to the tag database, you may double click on the tag name field to enter a new tag name. You may also change the r/w (Read/Write) property and make the tag read only. You may now select any tags by clicking on its checkbox (or the Select All check box) and then click on **Create Tag(s)** button to transfer the selected tags to the tag database.

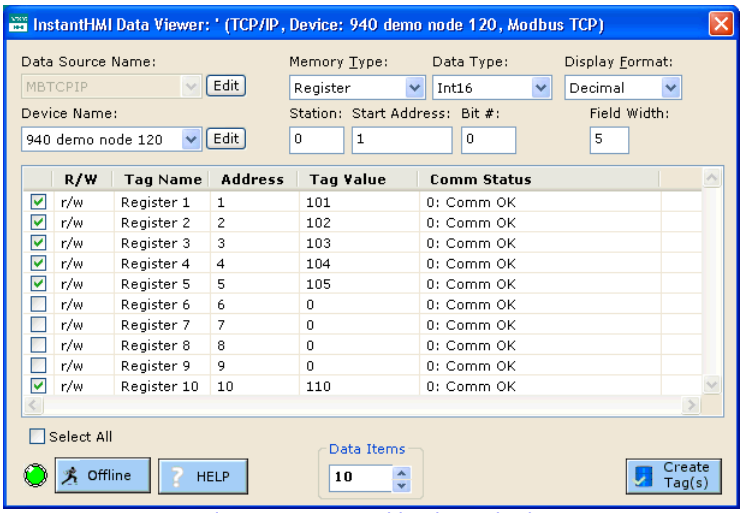

InstantHMI Data Viewer: ' (TCP/IP, Device: 940 demo node 120, Modbus TCP)
Data Source Name:
MBTCPIP
Edit
Device Name:
940 demo node 120
Edit
Memory Type:
Register
Data Type:
Int16
Display Format:
Decimal
Station:
0
Start Address:
1
Bit #:
0
Field Width:
5
R/W | Tag Name | Address | Tag Value | Comm Status
r/w | Register 1 | 1 | 101 | 0: Comm OK
r/w | Register 2 | 2 | 102 | 0: Comm OK
r/w | Register 3 | 3 | 103 | 0: Comm OK
r/w | Register 4 | 4 | 104 | 0: Comm OK
r/w | Register 5 | 5 | 105 | 0: Comm OK
r/w | Register 6 | 6 | 0 | 0: Comm OK
r/w | Register 7 | 7 | 0 | 0: Comm OK
r/w | Register 8 | 8 | 0 | 0: Comm OK
r/w | Register 9 | 9 | 0 | 0: Comm OK
r/w | Register 10 | 10 | 110 | 0: Comm OK
Select All
Offline
HELP
Data Items
10
Create Tag(s)

Figure 3-3: Data Table Viewer (PC)

3.2.2 Data Table Tool (PDA)

The Data Table Viewer discussed in Section 3.2.1 is implemented on the PDA platforms, (to suit their smaller form factor), as shown below.

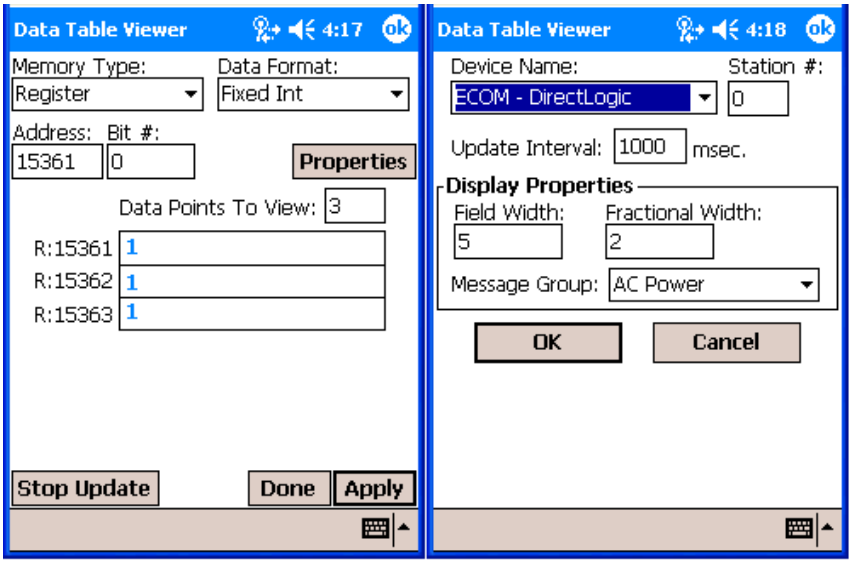


Figure 3-4: Data Table Viewer (PDA)

To use the data table, you enter the (Start) Address and the number of data Points to view of the selected Memory Type of interest. Tap on the Properties button to review and/or change any associated Data Table Properties. Tap on the **Start Update** button to read the memory locations and update the data values in the data table. Tap on the **Stop Update** button after viewing data. Tap on **Done** or **OK** to leave the screen.

3.3 Tag Database

3.3.1 Tag Database Manager (PC)

In the Screen Designer, click on **Tools → Tag Manager** to design, edit and manage the tag database to suit your project needs. You will see the Tag Manager dialog box showing a tree structure displaying all the defined tags and tag groups in your tag database. Buttons are provided to access Database Functions, tag Group Functions and Tag Functions.

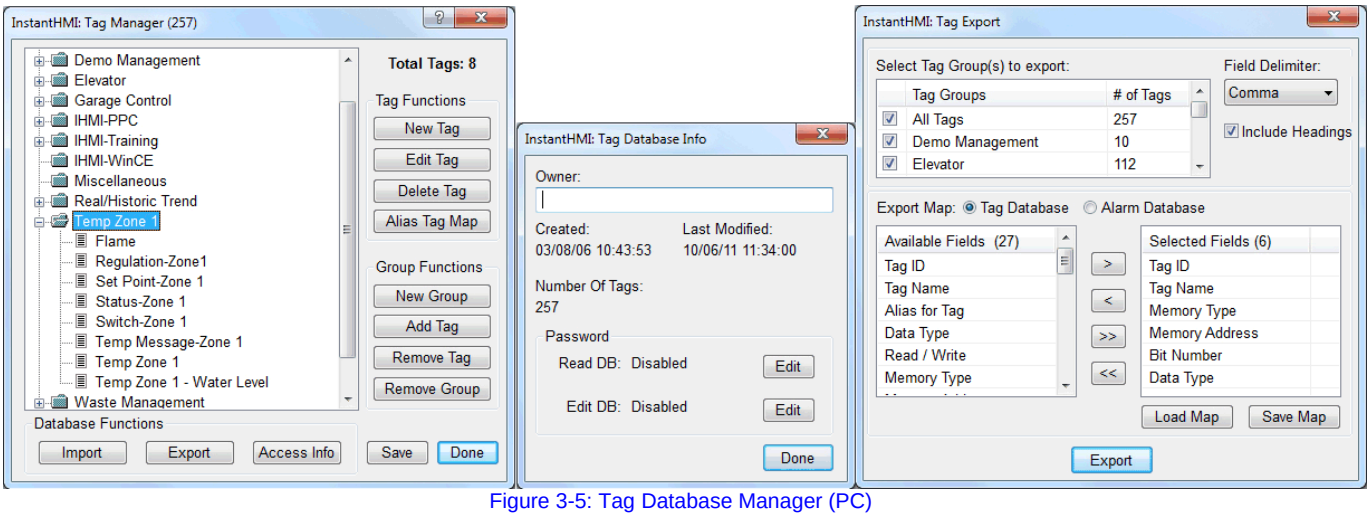


Figure 3-5: Tag Database Manager (PC)

Click the **Access Info** button to see the Database Info and the password protection of Database contents from editing by unauthorized persons. Click the **Export** Database button to pop-up the Tag Export dialog. Here you can select Field Delimiter (Comma shown), and define a Map (which will show how tag information fields are mapped to the exported fields) to write to the export (CSV) file from the Tag Database. The default CSV filename is IHMI-TagExport.csv (with the associated IHMI-TagExport-Groups.csv containing group names. This CSV file can then be imported into Excel (or similar program) for viewing/editing. You may save the MAP used for export and then later Load the same map while importing. Click the **Import** Database button to import tag information from a (CSV) file into the Tag Database. The default CSV filename is IHMI-TagExport.csv (with the associated IHMI-TagExport-Groups.csv containing group names), however, you can import any file that is in the correct format. While defining a large number of tags and Tag Groups the following approach might be a big time saver:

- Define the anticipated tag group names
- Define one or two representative tags (for each memory type) and assign them to desired tag groups
- Export tag database (IHMI-TagExport.csv containing). Edit tag database (using Microsoft Excel or other suitable software) to add/define additional tags.

Note: We recommend that you do the editing of group membership only in the Tag Manager. However, if you wish to do this while you are editing the tag information, you may do so (carefully) using the group names and Group ID in IHMI-TagExport-Groups.csv, and the Tag Number (ID) in IHMI-TagExport.csv.

The **Tag Groups** and their tag members are displayed in the tree diagram in the Tag Manager. The tag groups are listed alphabetically. Note that the special default group called **All Tags** includes all the tags in the tag database. Likewise, the special group called **Alias Tags** includes all the alias tags (for other tags in the tag database). Any group with a **'+'** sign on its left contains one or more tags assigned to it; to see the collapsed tags assigned to this group click on the **'+'** sign. To collapse a tag list in view under its group heading, click on the **'–'** sign attached to the group. Double click on a tag (or a tag group) in the tree to view and / or edit the details. To select a tag (or a tag group) click on it and see your selection hi-light.

You may access the three tag functions New Tag, Edit Tag and Delete Tag (Section 3.3.4), the 'Alias Tag' function (Section 3.3.3), and the four Group functions New Group, Add Tag, Remove Tag(from group), and Remove Group (Section 3.3.2) by clicking on the corresponding function buttons. Click on **Save** button periodically while working with the Tag Manager. Click on **Done** when you are finished with the Tag Manager.

3.3.2 Tag Group Functions (PC)

InstantHMI maintains a database of all the various information items ('tags') of interest to you in a tag database. Any tag maybe assigned to one or more tag groups for convenient access to the controller information in functional groups.

Four Group Function buttons are provided in the tag manager. The **New Group** button is used to create a new Tag Group name. (For convenience, this button is also available in the Tag Editor dialog box when you click on the Add Tag to Group button). The **Remove Group** button is used to remove a group from the list of groups. The **Add Tag** to group button is available in the Tag Manager dialog as well as the Tag Editor dialog. Likewise, the **Remove Tag** from group button is available in the Tag Manager dialog as well as the Tag Editor dialog.

Any tag may be assigned to one or more tag groups. If the tag and the group are already created you may select the group and click the **Add Tag** to group button and use the popup dialog to select the tags you like to add to the group. Alternatively, while creating or editing the tag definition in the Tag Editor, you may click on the **Add Tag** To Group button. This will display the available Tag Groups that you can assign the tag to. To assign the tag to a new group (not in the list of groups) click on the **New Group** button and create a new Tag Group name. Click on one of the available Tag Groups to select it; the selected group is hi-lighted. Click OK to assign the tag to the selected group, or Cancel to make no group assignment. You will return to the Tag Editor dialog. Note the tag groups that the current tag has been assigned to. Click on OK to finish the tag definition (and assignment to tag groups) and return to the Tag Manager dialog. Continue to define all the tags, and tag groups and make the tag assignments to one or more groups as needed.

3.3.3 Tag Alias (PC)

A 'Tag Alias' is just another name for a tag. You may assign one or more tag aliases to any tag name. InstantHMI treats Tag Alias as a pointer to another Tag. You may use multiple aliases for a single tag; however, you may not use an alias for another alias. Tag Alias is useful when a controller tag name (Example: ControlLogix Tag Name or Bristol Signal Name) is not known when designing your tag database and screen objects and you need to refer to a controller tag 'on the fly'.

3.3.4 Tag Editor (PC)

When you click on the **New Tag** button (in the Tag Manager) you will see the Tag Editor dialog box, with a blank Tag Name. To create a new tag related to an existing tag (differing in tag name and or some other tag parameters) select the existing tag and then click on the **Edit Tag** button to access the Tag Editor dialog box.

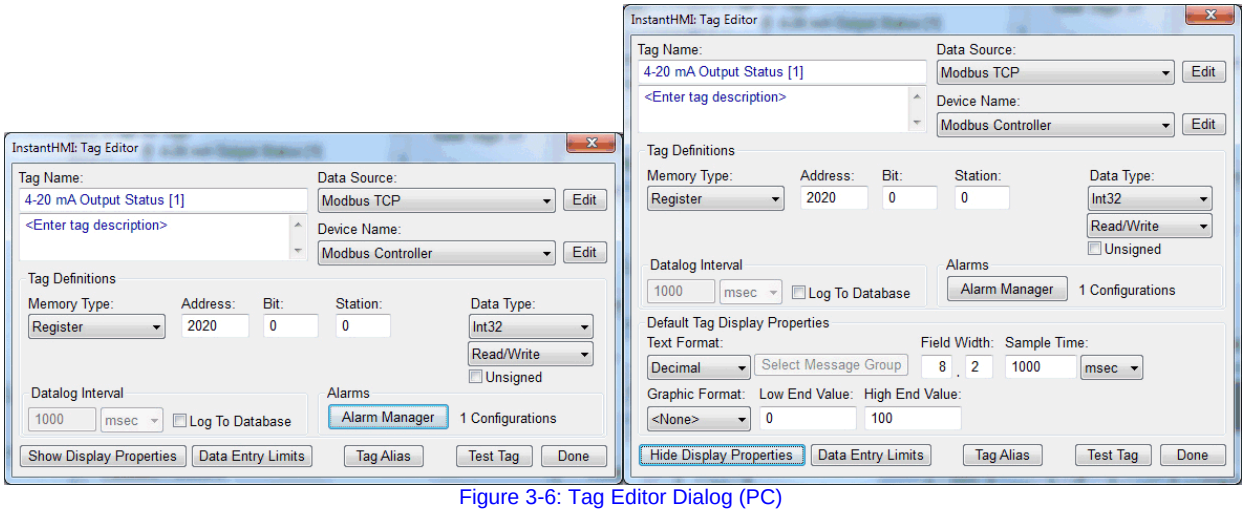


Figure 3-6: Tag Editor Dialog (PC)

Note: The 'Show Display Properties' button exposes the Tag Display Properties. These display properties stored with the tag definition are used for pre-formatted screen display objects in InstantHMI (usually on non-PC platforms). The Screen Designer can access the Active Object (Display) Properties (Section 4.6.2) stored with objects on user designed screens; these properties supersede the default display properties stored with the tag definition.

Tag Name

Click on the **Tag Name** field and enter a descriptive tag name. This identifies the information item you need from your controller for monitoring, data logging etc.

Note1: You may also assign a 'Tag Alias' to a tag name (Section 3.3.3). A Tag Alias is useful when a controller tag name (Example: ControlLogix Tag Name or Bristol Signal Name) is not known when designing your tag database and screen objects and you need to refer to a controller tag 'on the fly'.

Note2: Group membership of the tag are managed in the Tag Manager using the **Add Tag** To Group and the **Remove Tag** From Group buttons.

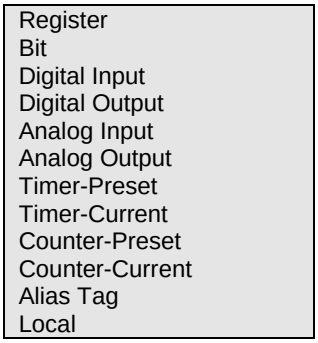
Data Source and Device Name

The **Data Source** for the tag provides the raw data of the tag object. If no Data Source has been defined, click on Edit (Data Source) button to invoke the Data Source Manager to define data source parameters (including a comm-link).

If your Data Source uses TCP/IP communications you also need to select a network **Device Name** from the pull down list to associate that Device Name with the tag. If no device name has been defined, click on Edit (Device Name) button to invoke the IP Manager, which allows you to associate an IP Address/Port Number to a "Device Name".

Tag Definitions

The Tag Definitions (Memory Address, Bit , Station and Data Type) completely specify the data source for the tag value. The **Data Type** may be a single Bit, 8-bit Byte, 16 or 32 bit integers (Int16, Int32), single float value (32 bits) or double float value (64 bits), or a String of 8-bit text bytes. Check the Unsigned check box if the raw data is unsigned. You may make any tag 'Read Only' or allow both 'Read/Write' by the operator at runtime.



Click on the **Memory Type** pull down list to select a memory type. This list will depend on the communication driver for the controller identified in the Data Source. Many different memory types are supported in InstantHMI.

By choosing the appropriate items from the Memory Type pull down list you connect the tagged data field on the screen with memory locations in your controller (or Local memory provided in InstantHMI) for your data items. The discussion here is generic for all controller types. See Appendix C, Section XX (XX = driver number for your controller) for additional model specific information.

Choose **Register** if you wish to use a data register (16 bits usually) from your controller for the data. Choose **Bit** to use a specific bit in a register for the (Boolean) data for this field. Choose **Digital Input** to specify discrete inputs and **Digital Output** for discrete outputs. Choose **Analog Input** to specify analog inputs and **Analog Output** for analog outputs. Choose **Timer-Preset** to use preset value of Timers and **Timer-Current** for current value of Timers. Note that the Timer choices may not be distinct for some PLC's which use Register for this purpose. Choose **Counter-Preset** to use preset value of counters and **Counter-Current** to use current value of counters; note that the counter choices may not be distinct for some Controllers which use Register for this purpose. Choose **Alias Tag** if you wish for this tag to inherit its memory type (and other tag properties) from another tag defined earlier. You may access the 'Alias Tag Map' from the Tag Manager (Section 3.3.3).

Choose **Local** if you wish to use local storage for the data item. Local Memory is provided for storage of the screen field data without using up controller registers that incur a communication overhead. Local memory is allocated from your computer memory; you may use any addresses (except the ones reserved for special purposes as documented below). We recommend you not use 2xxx and 3xxx addresses except as provided below.

Certain 2000 Series Addresses (2000, 2001-2005 etc.) are reserved for special purposes. You may set Local 2000 = 1 to disable the special functions provided in Local 2001-2005, etc. Some Local Memory addresses are used for the simulated variables as noted in table below.

Local Memory Address	Simulated Function
2000	Disable the special Local Memory Functions here (1= disable)
2001	Random number between 0 and 100 at each sample time
2002	Counter that counts up from 0 to 100 and then counts down from 100 to 0
2003	Counter that counts down from 100 to 0 and then counts up from 0 to 100
2004	Random number between 0 and 100 at each sample time (different from 2001)
2005	Random number between 0 and 100 at each sample time (different from 2001, 2004)

Certain 3000 Series Addresses (3000, 3001-3099) are documented here and are meant to be used by Software Horizons personnel for troubleshooting purposes only. You may set Local 3000 = 1 to disable the special functions provided in Local 30xx.

Local Memory Address	Simulated Function
3000	Disable the special 3000 series Local Memory Functions here (1= disable)
3001	Polling Thread - Thread Status (1=Active, 0=Bad)
3002	Polling Thread -Thread Activity Counter (counts up from 0 to 64000)
3003	Polling Thread - Elapsed Time in each thread iteration (milli-sec)
3005	Polling Thread - Elapsed Time in each thread iteration (micro-sec)
3007-3010	Reserved
3011	TCP/IP Client Request - Thread Status (1=Active, 0=Bad)
3012	TCP/IP Client Request - Thread Activity Counter (counts up from 0 to 64000)
3013	TCP/IP Client Request - Elapsed Time in each thread iteration (milli-sec)
3015	TCP/IP Client Request - Elapsed Time in each thread iteration (micro-sec)
3017-3020	Reserved
3021	TCP/IP Client Update - Thread Status (1=Active, 0=Bad)
3022	TCP/IP Client Update - Thread Activity Counter (counts up from 0 to 64000)
3023	TCP/IP Client Update - Elapsed Time in each thread iteration (milli-sec)
3025	TCP/IP Client Update - Elapsed Time in each thread iteration (micro-sec)
3027-3031	Reserved
3032	Switch Screen Function - Function Activity Counter (counts up from 0 to 64000)
3033	Switch Screen Function - Elapsed Time in each Function iteration (milli-sec)
3035	Switch Screen Function - Elapsed Time in each Function iteration (micro-sec)
3037-3060	Reserved
3061	CPU Clock Speed (Hz)
3065-3090	Reserved
3091	Alarm Status (0 = No Alarms, 1 = Active Alarms Present)
3092	Total Number of Active Alarms Present
3093	Total Number of Active Alarms Priority P0
3094 - 3098	Total Number of Active Alarms Priority P1, P2, P3, P4, P5 respectively
3099	Reserved

After choosing data Memory Type you must specify the appropriate Address and Bit number. To do this, move the mouse cursor to the **Address** field and click the left button and observe that an I-bar appears in this edit field. Type in the address number. Since in most cases Screen Designer has no way to check for valid addresses, you must enter a valid address. The range of valid address for Register memory will depend on the particular controller you are using. Note that Screen Designer will accept addresses as integers only. When a **Bit** Number is required in addition to a register address (for a complete specification of the address for Bit Data Memory, for example) you must enter a bit number.

InstantHMI allows communication with multiple PLC or I/O devices concurrently. These devices may be connected in a multi-drop or network arrangement to a single Com Port on the computer. InstantHMI also supports communication via multiple Com Ports concurrently. You have the option of choosing same or different communication drivers for the different Com Ports to meet your requirements. These PLCs which serve as the raw data sources are identified in the Data Source manager, which allows you to identify the Com Port parameters and communication diver that will be used to communicate with a group of PLC in a multi-drop or network setup. Enter the **Station** number (as part of the Tag definition) to identify the specific PLC, which has the raw data for the current data field.

Example: Suppose you have three Modicon PLC's with station numbers 1,2,3 in a Modbus network connected to COM1 on the computer, and one Allen Bradley PLC with station number 9, connected over a serial DF1 link to COM2 on the computer. Suppose you have four data display fields on your screen each one showing data from one of the four different PLC's connected to the two Com Ports on the computer. Your tag specifications for these fields may be as shown below:

Field	Data Source	Station	Remark
1	DS1	1	DS1 defines Modicon-Modbus Com Parameters
2	DS1	2	DS1 defines Modicon-Modbus Com Parameters
3	DS1	3	DS1 defines Modicon-Modbus Com Parameters
4	DS2	9	DS2 defines AB-DF1 Com Parameters

Station Offset (PDAs): InstantHMI allows communication with multiple PLC or I/O devices concurrently. These devices may be connected in a multi-drop or network arrangement to the serial

port on the PDA (or to an infrared head, which can be beamed at using the built-in infrared transceiver on the PDA). The actual station number used by the comm driver is Station Number + Station Offset. The default value of Station Offset is 0. The use of Station Offset (a single editing change in the PDA) allows a group of tags defined for one controller station to be used to communicate with a different controller station if necessary.

Note: Dynamic Station Offset changes (via Local/Register Memory) may be used to avoid End-Users having to go into Comm Setup.

Datalog Setup

Click the Log to Database check box in the Tag Editor dialog box if you wish to log the data in a monitored data field to an ODBC compatible database InstantHMI.MDB for historical trending (Section 13) or other analysis using tools available to you. You may select the Datalog Interval (defaulted to 1 sec. Specifying a smaller datalog sample time, will cause data to be logged more frequently; a higher sample time leads to the tag value to be logged less frequently. Note that your InstantHMI installation must have the Historic trending option installed for the logged data to be useful for trending analysis. (You can see all the 'Datalog Tags' in Launchpad → Design → Tags.)

Alarm Setup and Management (Section 17 has a detailed discussion on Alarm management)

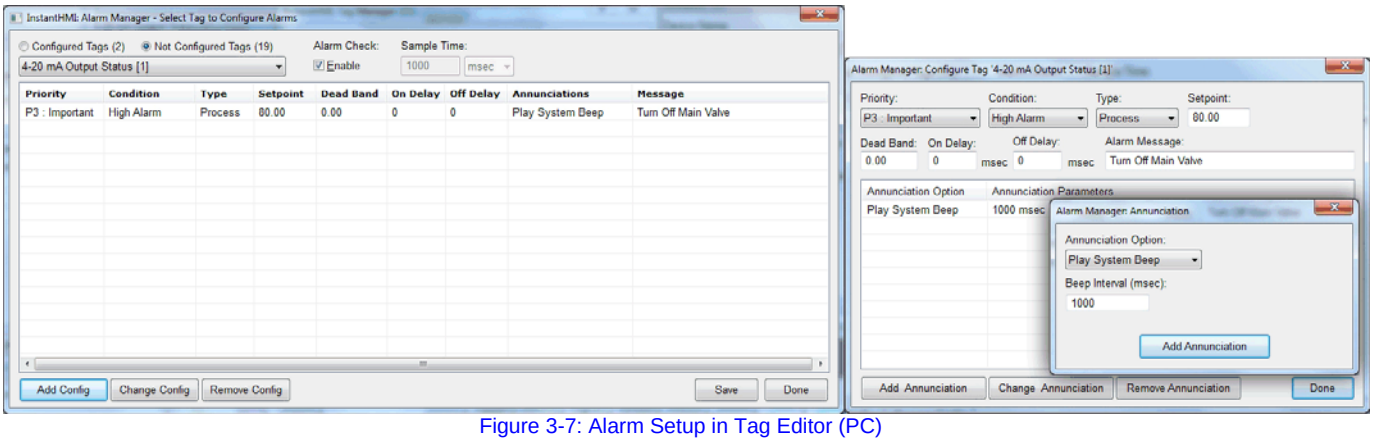


Figure 3-7: Alarm Setup in Tag Editor (PC)

In Tag Editor you may Enable Alarm Check against Alarm Setpoints you designate. If the data type is Monitor then a High or Low alarm will be generated at runtime if data exceeds the specified limit. The data field value will be checked at each Sample Time to ascertain if the field is in alarm condition. At first, you should enable alarm check only for changing data that is critical. If the performance of InstantHMI is satisfactory, then you may include other less critical data fields for Alarm checking. Note that this feature may also be used with (Boolean) Bit memory. (You may play a sound file during alarm conditions.)

InstantHMI allows you to specify for each tag several possible alarm conditions including low, high, low-low and high-high alarm conditions. In addition, other types of alarm triggers such as Range of values can be specified. For these alarm conditions InstantHMI provides an Annotation parameter which accepts operator entered text (while acknowledging the alarm to record the symptoms observed. The alarm description will be available and displayed in the alarm monitoring and history screens. You may also specify a dead-band to eliminate momentary alarm conditions based on the length of time the tag is in alarm condition. Corrective actions and/or suggestions previously recorded in a Troubleshoot Scripts database may be accessed from the Alarm Viewer. If a tag goes into alarm condition it can initiate execution of scripts or macros (for example, spool/print reports). If a tag goes into alarm condition it can cause the logging of the currently logged in user name to the alarm log. When the Alarm is acknowledged, it may be annotated and recorded in the Alarm History, to be accessed from the Alarm Viewer.

When an object is in an alarm state, if the data object is a text data object then the object will flash on screen and may also produce an audible beep or play a .wav file, if setup to do so. Most widget objects do not indicate any kind of alarm condition for the object.

Event Manager / Scheduler

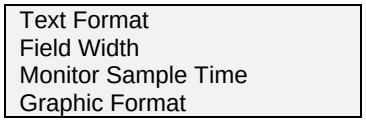
(Note: Some features in this paragraph may not be available in the current implementation)
InstantHMI implements an Event Manager which allows you to define any number of Events and lets you assign the actions to be taken by the runtime engine and the LaunchPad when any of these events is detected. That is,

if (Event) then Action.

An event may be any function involving tag data values such as a combination of tags being in a certain range of values at the same time (where none of the tag values may be an alarm condition). These events may trigger a script, spool/print a report, initiate a call to User DLL function (written by you), play sound/video clips, or start data logging of a predefined tag group. Event scheduling would be another useful feature. Here users could schedule scripts to execute, spool or print reports, and other features based on a Time of Day, Hourly, Daily, Weekly, and/or Monthly basis.

Tag Display Properties (Default)

Note: The 'Show Display Properties' button exposes the Tag Display Properties. These display properties stored with the tag definition are used for pre-formatted screen display objects in InstantHMI (usually on non-PC platforms). The Screen Designer can access the Display Object Properties (Section 4.6.2) stored with objects on user designed screens; these properties supersede the default display properties stored with the tag definition.



Text Format

See Section 4.11.2.

Field Width

The first field indicates the total number of digits for the data field. The second field (following the implicit decimal point) allows you to specify the number of (implicit) Decimal Places in the data value (integer: Int16, or long: Int32, signed or unsigned) stored in registers. InstantHMI supports the concept of **Fixed Format** integers to promote operator understanding of displayed raw data (unsigned or signed). This concept also implies an implicit scaling of the data stored in the register.

Example: Suppose the physical variable is a voltage 1.056V. Stored as milli-volts (scaled by a factor 10^3, 1.056V = 1056mV) this represents the raw data value 1056 in the data register. To display this variable as 1.056 on screen, use the fixed integer format with number of decimals = 3. This will cause the raw data value 1056 (stored in the register) to be displayed on screen as the fixed integer 1.056 with 3 decimal places which exactly matches the external physical variable. Note that you should specify a Field Width to accommodate all the digits in the number (= 4 or more in this example).

Monitor Sample Time

See Section 4.11.7.

Graphic Format

See Section 4.11.3 and Section 4.11.5.
You can specify a **Low/High End Value** for Graphical Widgets (Sections 4.11.3, 4.11.5). These limits are for display/input purposes. Setting a Low/High end value for non-graphic tags has no effect.

Tag Display Information (for non-PC Platforms)

Any tag may be associated with more than one display object. The important parameters in the display object properties dialog (Section 4.6.2) are included for convenience in the Tag Editor dialog in the 'Tag Display Information' panel. The information in this panel is used only when a pre-formatted screen object requires the tag display information. This is the case, for example, when the tag database is deployed on a Pocket PC platform. Tag display information panel shows the default Field Width value of 5, which is compatible with the highest number (32767) that can be stored in the 16 bit PLC registers. For Message data display format the field width should be large enough to accommodate the longest message; also, click on the Select Message button to invoke the Message Manager (Section 3.4) and select the message group containing the text messages to be associated with the values for the data field. To change Field Width, click inside its edit box (the mouse pointer changes to an I-beam) and enter the width. If the display format is Fixed, enter the number of Decimal Places to the right of the decimal point.

Data Entry Limits

Click on Data Entry Limits button to specify High and Low limits for data entry. If the data type is Input, then the Operator entry will be restricted to be within the High and Low limits specified.

Tag Alias

Click on 'Tag Alias' if you wish to assign an alias to a tag name. A Tag Alias is useful when a controller tag name (Example: ControlLogix Tag Name or Bristol Signal Name) is not known when designing your tag database and screen objects and you need to refer to a controller tag 'on the fly' using its name in the controller. Since the communication driver provided in InstantHMI for your controller is aware of the communication requirements of the controller, the appropriate 'Signal Name' will be used via the 'Tag Alias' feature implemented in InstantHMI (Section 3.3.3).

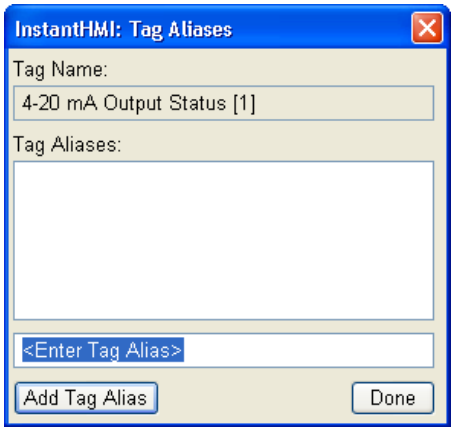


Figure 3-8: Alias Tag Map

Test Tag

Click on the Test Tag button to invoke the driver referred to in the data source (if it is valid and you have a PC runtime engine installed); the driver will display the tag value if the communication required for the tag was successful.

Done and Cancel

The Tag Editor dialog box includes several fields that were discussed above. After completing the tag parameter editing and specifications click on the **Done** button to save the changes you made or click on the **X** button to cancel and discard the changes you made.

3.3.5 Tag Database Manager (PDAs)

You may access the **Tag Manager** in InstantHMI runtime on the PDA by tapping on the Tag Manager button on the 'Tag Variables' pop-up dialog. If the tag database is password protected (Passwords assigned to Read or Modify tag database) you will be asked to 'Enter Password'. Depending on your password you will be allowed to view or modify the tag database. Once you enter your password and tap OK, you will see the Tag Manager with a list of all tags from the tag

database (in a scrollable table) on the screen. The '# of tags' in the tag database is displayed at the top.

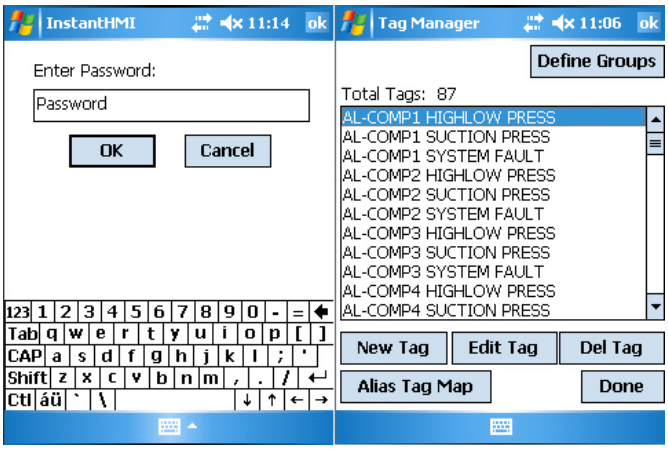


Figure 3-9: Tag Database Manager (PDA)

The **Tabbed Scroll Bar™** provides rapid scrolling even when you have a very long list (of tags). Use the arrows above and below the Tabs (A,B,C,...Z). Note that any specific alphabet tab is included only if there are any tag names starting with that alphabet. When you tap on a Tab (say, the letter S) you will see the alphabetized list of all tags starting with the letter 'S'. Now you may use the (Down/Up Arrow) inside the tag list view to scroll further. To select any existing tag from the scrollable list of tags just tap on it; the selected tag will be highlighted. Tap on the **Del** button to delete the selected tag from the tag database. To edit the selected tag tap on the **Edit** button. To define a new tag (and add it to the tag database) tap on the **New** button. The Tag Editor screen (Section 3.3.7) appears and you can enter your tag specifications for the new or edited data item. Tap on the **Define Groups** button to define the tag groups (Section 3.3.6).

Tap on the Done button to exit the Tag Manager screen.

3.3.6 Tag Group Functions (PDAs)

The tags in a tag database are assigned to various tag groups. You may access the Tag Group Definitions by tapping on the **Define Groups** button on the Tag Manager screen. You will then see the tag group definitions screen.

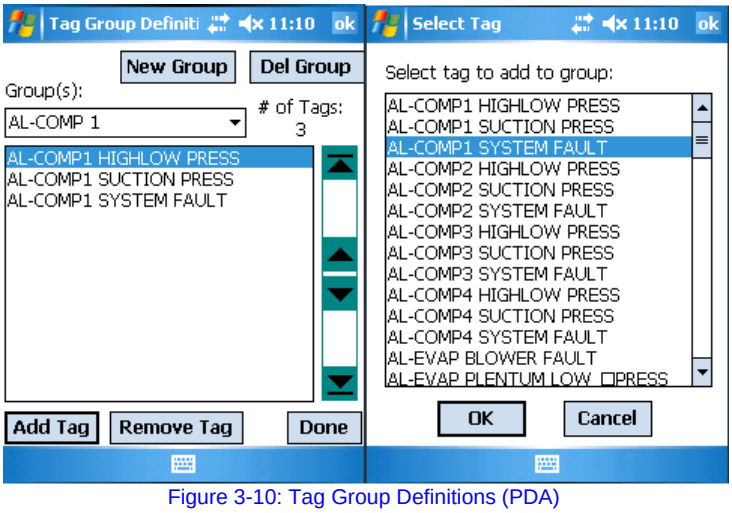


Figure 3-10: Tag Group Definitions (PDA)

Tap on the **New Group** button, to define a new Tag Group name. Tap on the **Del Group** button to delete the Group name (the tags in the group and the group name are displayed on the screen) from the list of Tag Groups. Note that the tags in the group will not be deleted but only the tag group

definition will be deleted. You select a different Tag Group to view on this screen (from the pull down list of Tag Groups) by tapping on the down arrow ▼ near the top of the screen, and then selecting the Tag Group from the list of groups shown. You will then see this (current) tag group name together with all the tags associated with this group. Do not mistake the Tag Positioning Bar (described below) for the scroll bar which appears when the number of tags exceeds the display area available. Use the scroll bar on the right to view all the tags in this group.

To select a tag tap on its name in the selected tag group. Tap on the **Remove Tag** button to remove the selected tag from the tag group. Tap on the **Add Tag** button and then select a tag name from the list of 'All Tags' to assign it to the current group. The functionality of the Tabbed Scroll Bar is exactly as described in Section 3.3.5.

The **Tag Positioning Bar** has four controls on it, which are used to re-position a selected tag within the group. The **Top** control moves the tag to the top of the list of tags in the group. The **Bottom** control moves the tag to the bottom of the list of tags in the group. The **Up** and **Down** controls in the middle move the selected tag one position up or down in the list of tags in the group. Thus, the Tag Positioning Bar allows you to visually define the exact order of the tags within a group. This is extremely useful while viewing the tags in a group on the scrollable Data Monitor or Graphic Monitor or the Bar Graph Monitor screens.

3.3.7 Tag Editor (PDAs)

When you Edit a selected tag from the tag database, or when you add a New tag to the tag database, you will see the Tag Editor screen. The Tag Editor screen includes several fields which are discussed below.

Tap on the **Tag Name** field and enter a descriptive tag name (the built-in keyboard on the PDA). This identifies the information item in your controller for monitoring, data logging etc.

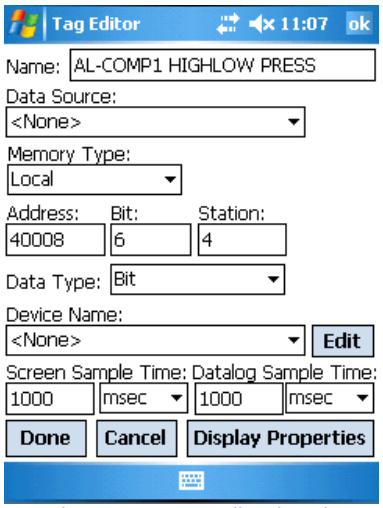


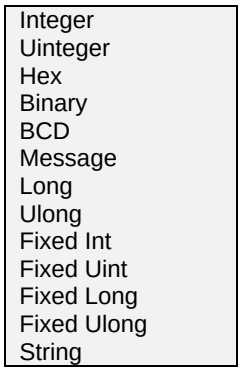
Figure 3-11: Tag Editor (PDA)

The **Memory Type**, **Address, Bit Number**, and **Station Number** are same as discussed in Section 3.3.3.

You may enter a **Monitor Sample Time** for each monitor field. InstantHMI provides a mechanism to update the data field (by continuously sampling the data memory associated with the Tag) at the sample time you specify. A smaller sample time means that this field will be checked more frequently; a higher sample time means that the field will be sampled less frequently. Sample time is specified in milliseconds or seconds. We recommend a minimum of 500 msec to ensure efficient communications.

You may enter a **Datalog Sample Time** for each field you wish to include in a datalog. InstantHMI provides a mechanism to log the data from the field (by sampling the data memory associated with the Tag) at the sample time you specify. Sample time is specified in milliseconds or seconds. We recommend a minimum of 500 msec to ensure efficient communications.

Tap on the **Data Format** pull down list ('down arrow' ▼) to select a data format from the list of available formats. Many different data formats are supported in InstantHMI.



Select **Integer** format if data in the field is to be a signed integer stored in a single (16 bit) register. Select **UInteger** if the data is to be an unsigned integer. Select **Hex** format if data in the field is to be represented as a string of hex digits 0-9, A-F. Select **Binary** format if data in the field is to be represented as a string of zeros and ones. Select **BCD** format if data in the field is to be a Binary Coded Decimal. Note that, in this case, the highest value you can store in a 16-bit register is 9999.

Select **Message** format if you wish to display an appropriate message from a Message Group. Note that "Message" format is valid even for Input (I on the runtime screen). You may create message groups and the messages for each group using the Message Manager (Section 3.4). After you select Data Format Message, tap on the **More…** button and select the message group where the messages for this tag field are listed and then tap Done in the More...Tag Properties screen.

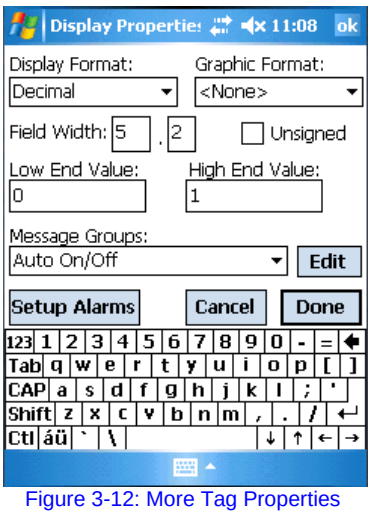


Figure 3-12: More Tag Properties

Choose Data Memory Register (or Local) and type in the Address xxxx etc. At run time the integer value in Register xxxx will be used as the message number to display the corresponding text message from the message group assigned to this tag field.

Example: We illustrate Register based Messages here. Suppose the message group Event Condition contains four lines of text (0. Low, 1. High, 2. Rise, 3. Fall), each line representing a possible message to be displayed in a field (data format = Message, data Memory = Register, Address = 123, Message Group = Event Condition). At runtime, if register 123 has the value 2 in it, then the text 'Rise' for line 2 in message group

'Event Condition' will be displayed. Also if the value in register 123 has no associated message text defined then the message text will be blanked.

Select **Long** format if data in the field is to be a signed long integer stored in two consecutive (16-bit) registers. Data will be stored with the least significant word at lower address. Select **ULong** if the data is to be an unsigned long integer.

Fixed Format, **Field Width**, and **Decimal Places** are as discussed in Section 3.3.3.

Graphic Format (Pocket PC)

InstantHMI takes advantage of the enhanced graphic capability of Pocket PC to support graphic format for display of the numeric data discussed earlier in this Section. Tap on the Graphic Format pull down list ('down arrow' ▼) to select a graphic format from the list of available formats. Many different graphic formats are available for convenient display of discrete or analog data for monitoring and data entry. Some of the graphic features discussed here may not be available or may differ slightly on your implementation.

The default graphic format is no graphics i.e. Numeric data will be displayed on the Data Monitor Screen (Section **Error! Reference source not found.**). The available graphic formats may be displayed on a Graphic Monitor Screen with small, medium, or large graphic widgets as illustrated below.

Select Graphic Format **LED** (Monitor Widget) to place an indicator light on the screen. You can enter the LED trigger value in tag editor screen. The LED assumes "Green Color" when the value in the associated memory address equals or exceeds the high-end value and assumes "Red Color" when the value is below the low-end value.

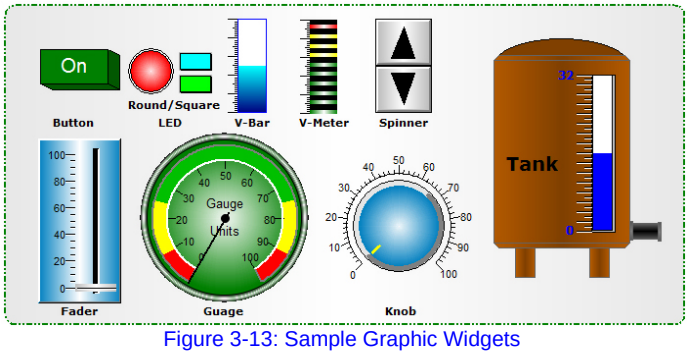


Figure 3-13: Sample Graphic Widgets

Select Graphic Format **Button** (Input/Monitor Widget) to place a button on the screen. The operator can toggle between two states Off and On. Note that you can tie a button to a bit memory (where On = 1 and Off = 0) or register memory (where On = high-end value and Off = low-end value).

Widgets Can Be Displayed			
Object	Small	Medium	Large
LED	Y	Y	Y
Button	Y	Y	Y
Spinner	Y	Y	Y
V – Bar	Y	Y	Y
Gauge	N	Y	Y
Fader	N	Y	Y
Knob	N	Y	Y
V – Meter	N	Y	Y
Tank	N	Y	Y
Dual Spinner	N	Y	Y

Select Graphic Format **Spinner** (Input/Monitor Widget) to place a thumb-wheel spinner on your screen that the operator can click on to increment or decrement the value in the associated memory address. You can set the Spinner high-end value and low-end value in tag editor screen. The range of the spinner is (Low End Value – High End Value) and it wraps around.

Select Graphic Format **V-Bar** (Monitor Widget) to have a dynamic vertical bar on the screen. The low end (0%) value and high end (100%) value along with the value in the register (whose address you must specify) will determine the % size of the vertical bar seen by the operator. The color of this vertical bar is fixed (Red).

Select Graphic Format **Gauge** (Monitor Widget) to have a dynamic needle moving in a circular arc enclosed in a box. You can set the data values for the low end and high end in tag editor screen. Note that the gauge Green range (0% - 40%), Yellow range (41% - 80%) and Red range (81% - 100%) are specified in %. Once you set the values, you will see the needle represent the associated memory address value on the gauge.

Select Graphic Format **Fader** (Input/Monitor Widget) to place a fader/slider on the screen. The operator can set any value between Low-end value and High-end value to an associated memory address by dragging the slider on the fader up and down or click on the fader slot. You can set the Low-end value and High-end value in tag editor screen.

Select Graphic Format **Knob** (Input/Monitor Widget) to place a knob on the screen. The operator can enter any values between low-end value and high-end value to an associated memory address by tuning the knob in any direction. You can set the low-end value and high-end value in tag editor screen.

Select Graphic Format **V-Meter** (Monitor Widget) to place a vertical meter on screen, which lights up strips of Green, Yellow and Red to indicate the values in associated memory address. You can set the meter low-end value and high-end value in tag editor screen. Note that the V-Meter Green range (0% - 60%), Yellow range (61% - 90%) and Red range (91% - 100%) are specified in %.

Select Graphic Format **Tank** (Monitor Widget) to see a tank with an embedded dynamic vertical bar on the screen. The memory address associated with the tank (Vertical Bar) represents the tank level. If level falls, the outlet is open; otherwise it is closed.

Select Graphic Format **Dual Spinner** (Input/Monitor Widget) to place a dual thumb-wheel spinner on your screen. The operator can click on either left (fast) or right (slow) thumb-wheel to increment or decrement the value in the associated memory address. You can set the Dual Spinner high-end value and low-end value in tag editor screen. The range of the dual spinner is (Low End Value – High End Value) and it wraps around.

You can specify a **Low/High End Value** for Graphical Widgets (like V-Bars and Spinners) and Trend Graphs. These limits are for display/input purposes. Setting a Low/High end value for Non-Graphics tags has no effect.

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Tap on the **OK** button to save the changes you made or tap on the **Cancel** button to discard the changes you made. The **More** button will be used if there is more specification available for any fields shown on this screen.

3.4 Message Database

InstantHMI allows you to define text messages corresponding to numeric values stored in controller registers or local memory. InstantHMI maintains a database of all the various message items of interest to you in a message database. A message database contains several message groups (each of which may be associated with one or more tags in the tag database). Each message group contains several message items. A message item consists of a numeric value and a corresponding text of message to be displayed on screen.

3.4.1 Message Database Manager (PC)

In LaunchPad click on **Design → Tags → Message Groups** (or in Screen Designer click on **Tag Data → Message Groups)** to access the Message Database Manager, where you can design, edit and manage the message groups and message items (associated with the tags in the tag database) to suit your project needs. You will see the Message Manager dialog box showing a pull down list of message groups defined for your project.

Figure 3-14: Message Manager

To define a new group name, click on the **New Group** button and enter the new message group name, select a reference group if desired, and then click OK.

For your convenience, you may define all messages for a project collectively in a 'Reference Group' and then let any Message Group define its messages by reference to messages from the reference group. All 'reference messages', that is, messages for a group with an associated reference group, must be created or edited in the reference group. Maintaining all message text in a single reference file may be very useful when dealing with multi-lingual setup. The 'Export' function allows all messages for all groups to be exported to a CSV file; you may add message groups and messages in the CSV file and use the 'Import' function to update your message database.

To define messages associated with any message group, select it in the list of message groups displayed in the Message Manager dialog, and then click the **New Msg** button. You will see the Message Editor dialog box where you can enter a message value and the corresponding text of the message to display. (If you indicated a 'reference group' for this message group, then select your message from the displayed list of messages from the reference group). All messages (message value and text of message) corresponding to the selected message group will be displayed in the table of messages in the Message Manager dialog box. To select a message click on it in the

message list box and see it hi-lighted. You may then click on the **Delete Msg** button to delete the message (from the message group) or click on the **Edit Msg** button to edit the selected message.

You may click on the **Copy Group** button to copy a selected Message Group and all its associated messages to another group name (which may be edited as needed to define a new message group quickly). You may click on the **Delete Group** button to delete a selected message group together with all messages in the group. Note that each message group has its own list of messages and deleting messages in a group does not affect copies of the same messages in other message groups.

3.4.2 Message Database Manager (PDAs)

You may access the Message Groups screen through the InstantHMI Menu Screen **(Tag Variables → Messages)**. If the Message database is password protected (Passwords may be assigned to Read or Modify Message database) you will be asked to 'Enter Password'. Depending on your password you will be allowed to view or modify the tag database. Once you enter your password and tap OK you will see the Message Groups screen.

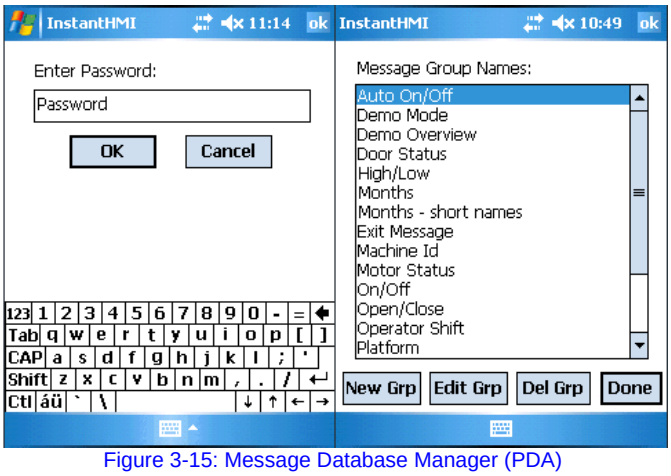


Figure 3-15: Message Database Manager (PDA)

You select a Message Group on this screen by tapping on the Message Group from the list of groups shown (you will see the selected group hi-lighted). The **Tabbed Scroll Bar™** (See Section 3) provides rapid scrolling even when you have a very long list (of messages). Tap on the **New** Group button, to enter a new Message Group name. Tap on the **Del** Group button to delete the selected message Group from the list of Message Groups. Tap on the **Done** button to leave the Message Groups screen.

Message Database

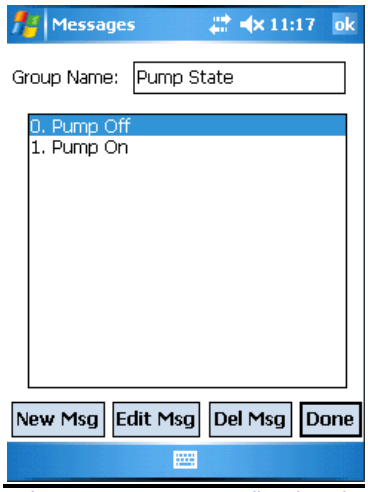


Figure 3-16: Message Editor (PDA)

Tap on the **Edit** Group button to edit the selected message group. You will then see a **Messages** screen with the selected message group name together with all the messages for this group. Use the scroll arrows on the right to view all the messages in this group. Tap on a message to select it. This hilights the message in the selected message group.

Tap on the **Del Message** button to delete the selected message from the message group.
Tap on the **Done** button to exit the Messages screen.

Tap on the **New** Message button on the Messages Screen to define a new message for the current group or tap on the **Edit** Message button to edit an old message. You will then see the Message Editor screen where you can define / edit the message item selected. Enter the numeric value and the text of message to display corresponding to this numeric value.

Tap on **OK** button to keep the new or edited message item for the message group or tap on **Cancel** button to discard the message item.

3.5 Image Database (Bitmap, JPEG, GIF)

InstantHMI allows you to define active images corresponding to numeric values stored in controller registers or local memory. InstantHMI maintains a database of all the various image items of interest to you in an image database. An image database contains several image groups (each of which may be associated with one or more tags in the tag database). Each image group contains several image items. An image item consists of a numeric value and a corresponding name of the image to be displayed on screen. Supported image types include Bitmaps, JPEG, GIF and PNG. The images are stored in files (having the same name) with the extension or file type as follows: Bitmaps (*.bmp), JPEG (*.jpg), and GIF (*.gif). **Note**: Images and other static objects may be laid on top of any active objects.

Note: Prior to version 5.1.4 Build 3005, IHMI-ImageDB.idb was named IHMI-BitmapDB.idb. If IHMI-BitmapDB.idb exists it will be renamed IHMI-ImageDB.idb when loading of the database occurs.

3.5.1 Image Capture Utility

Microsoft Windows provides the 'Paint' utility and the 'Clip Board' mechanism. You may use a screen or window print command (Shift + PrtScr or Alt + PrtScr or similar key combinations on your PC) to capture an image on the Windows 'Clip Board'. You may use any other application which allows you to copy bitmap images to the Windows clipboard. This captured image may be pasted in Microsoft Paint to create your images which may then be saved as a bitmap, jpeg or gif file.

InstantHMI Screen Designer provides a powerful Image Capture Utility to acquire images from other sources available to you. You may also use the 'Clip Board' image or previously saved images (which may include scanned photographs) as the source of your images in the Image Capture utility to create the images for use in your InstantHMI projects. To access the Image Capture utility, tap on the **Tools → Image Capture** in InstantHMI Screen Designer. You will see the following dialog.

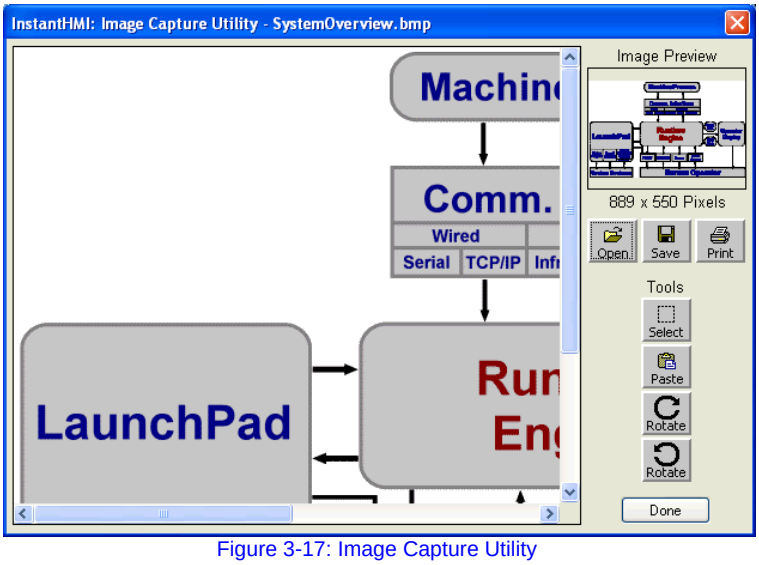


Figure 3-17: Image Capture Utility

The InstantHMI Image Capture utility includes several functions and tools (whose icons are displayed on the right) as described below. The image preview is useful if the image size (displayed) is larger than the editing display area.

1. **Open :** Open an image file by browsing the selected image type (*.bmp, or *.jpg, or *.gif) images in your project folder or elsewhere.

2. **Save :** Save the edited image.

3. **Print :** Print the edited image.
4. **Select :** Draw a rectangular region (clicking and dragging the mouse) in the displayed image and then click on 'Select' button to extract the desired region as your image for further editing.

5. **Paste :** This button allows you to grab the image from the Clipboard (left behind by some other application you used to create the image, such as Paint) for you to edit and save as your image.

6. **Rotate Right :** Rotates the displayed or cropped image right (90 degrees clockwise).

7. **Rotate Left :** Rotates the displayed or cropped image left (90 degrees anti-clockwise).

8. **Done :** Exit the Image Capture utility.

3.5.2 Image Groups (PC)

Click on **Tag Data → Image Groups** to design, edit and manage the image groups and images (*.bmp, *.jpg, *.gif) associated with the tag database to suit your project needs. You will see the Image Manager dialog box showing a list of image groups defined for your project.

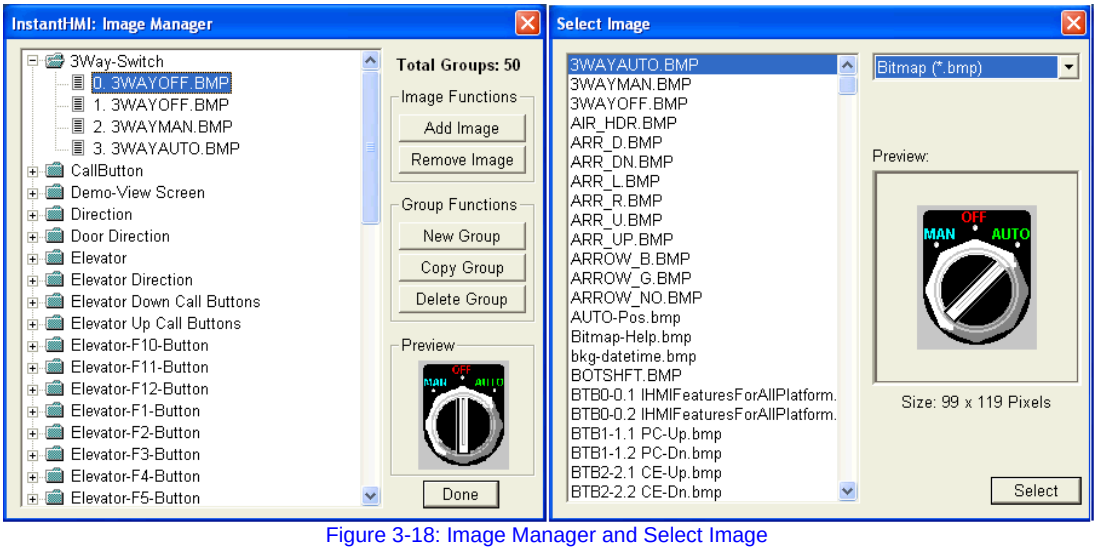


Figure 3-18: Image Manager and Select Image

To define a new group name, click on the **New Group** button and enter the new image group name and then click OK. To define images associated with any image group, select the group name from the list of image groups and then click the **Add Image** button. You will be asked to enter a value (or range of values) and then assign an image to display using the Select Image dialog box. Note that you may select the image type (*.bmp or *.jpg or *.gif) and then select from available images of the type you chose. All images (image value and associated image) corresponding to the selected image group will be displayed in the table of images in the Image Manager dialog box. To select an image click on it in the image list box and see it hilighted. You may then click on the **Remove Image** button to delete the image (from the image group).

You may click on the **Copy Group** button to copy a selected Image Group and all its associated images to another group name (which may be edited as needed to define a new image group quickly). You may click on the **Delete Group** button to delete a selected image group together with all images in the group. Note that each image group has its own list of images and deleting (names of) images in a group does not affect copies of the same image names in other image groups.

3.5.3 Image Groups (PDAs)

InstantHMI allows you to define images corresponding to numeric values stored in controller registers or local memory. InstantHMI maintains a database of all the various image items of interest to you in an image database. An image item consists of a numeric value (or range of values) and a corresponding image to be displayed on screen.

3.6 Recipes and Configurations

Recipes in InstantHMI are useful for repeatable and quick batch process setup. Configuration parameters from one controller may also be saved and reused to setup other similar controllers instantly. The Recipe function is similar to Configuration function. Both recipes and configurations are defined in terms of Templates (tag groups) in InstantHMI. You may think of a Recipe as an underlying script (implemented in the controller) whose parameters (like the configuration parameters) are stored in the InstantHMI runtime platform.

3.6.1 Recipes (PC)

InstantHMI allows you to create and maintain a 'Recipes' database which includes recipe templates with associated tags and corresponding nominal tag values. Think of a template as defining the structure of a recipe. A specific recipe is derived from its associated template, given its recipe name and associated tag values by refining the nominal template tag values (usually at runtime). The

'Recipes' Database is included as one of the project elements. To review recipes, click on LaunchPad → Design → Screens and select 'Recipes' in the Screen Elements column and then click on the **Recipe Manager** button.

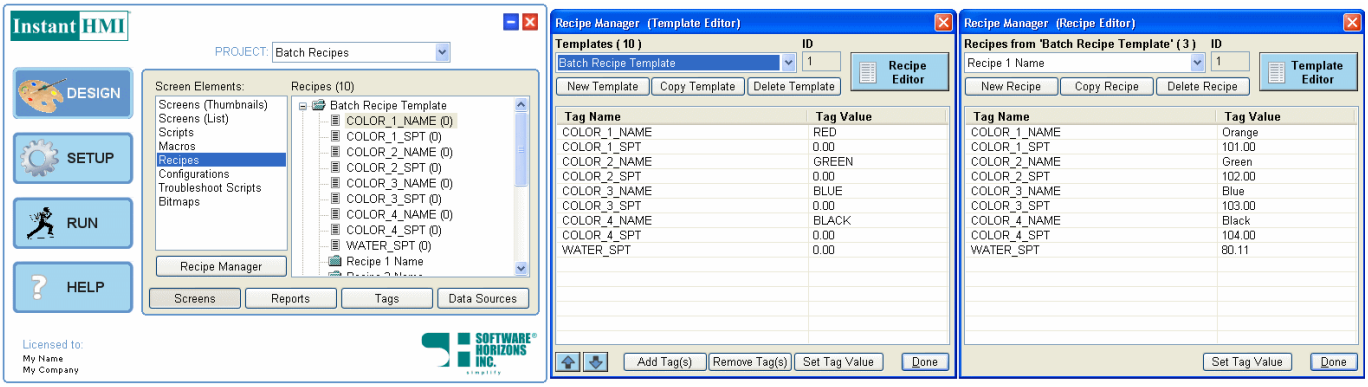


Figure 3-19: Recipe Manager (PC)

The Recipe Manager dialog box shows a pull down list of recipe templates defined for your project and the tags (with associated tag values) included in the definition of the template. The Recipe Manager has two views (see Figure 3-19).To switch between these two views click on the 'Recipe Editor' or 'Template Editor' button in the Recipe Manager dialog.

Template Editor Functions

Use Recipe Manager Template Editor Functions (New/Copy/Delete Template) to create and manage the recipe templates in the 'Recipes' database. To create (define) a new recipe template, click on the **New Template** button. The tags included in the template (recipe structure) together with their nominal tag values are listed in the Recipe Manager dialog. To include a new tag in the template, click on the **Add Tag(s)** button, select the tag(s) from the tag database displayed and click Done. To edit the template tag value (which defaults to zero), click on the tag to select it in the list of template tags, click on the **Set Tag Value** button and then enter the tag value for the template. (You may also double click on the tag to edit it.) To exclude a tag from the list of template tags, click on it to select it and then click on the **Remove Tag(s)** button.

To define a new template quickly, you may click on the **Copy Template** button to copy a selected template to a new template name and then edit it as needed. Use the Up/Down arrow buttons to re-order the tags in the list. To delete a selected template click on the **Delete Template** button. Note that the tags included in the template definition will not be deleted from the tag database, but they will no longer be included in the template (that is, recipe structure).

Recipe Editor Functions

Use Recipe Manager Recipe Editor Functions (New/Copy/Delete Recipe) to create and manage the recipes associated with any selected template in the 'Recipes' database. To create (define) a new recipe, click on the **New Recipe** button and enter a recipe name. The tags included in the recipe (derived from the template) together with their nominal tag values are listed in the Recipe Manager dialog. To edit the recipe tag value (which defaults to the associated template tag value), click on the tag to select it from the list of tags, click on the **Set Tag Value** button and then enter the tag value. (You may also double click on the tag to edit it.)

To define a new recipe quickly, you may click on the **Copy Recipe** button to copy a selected recipe to a new recipe name and then edit it as needed. To delete a selected recipe click on the **Delete Recipe** button.

3.6.2 Recipes (PDA)

When InstantHMI is running, tap on the **Utilities → Recipes** button. This brings up the following screen (if the Recipe option is included in your InstantHMI installation):

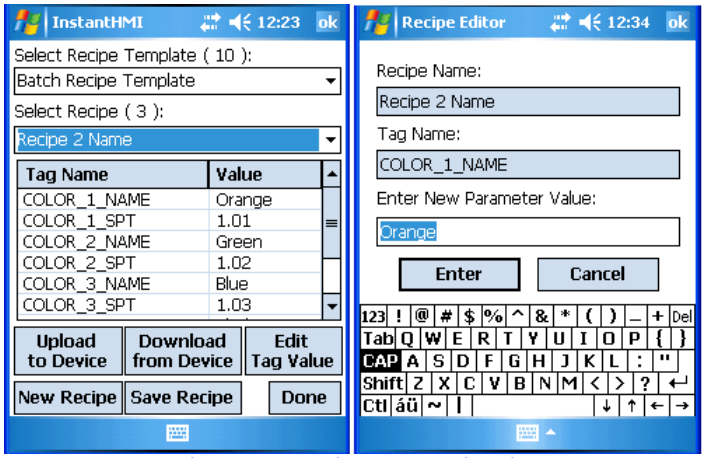


Figure 3-20: Recipe Manager (PDA)

Select the desired Template from the (previously defined) pull-down list of templates by tapping on the down arrow ▼ at the top. Select the desired recipe from the (previously defined) pull-down list of recipes by tapping on the next down arrow ▼. You can now preview the selected recipe parameters in the scrollable table, which lists tag names with their values shown in editable fields. Tap on the **New Recipe** button to define a new recipe (under the selected template). To edit a recipe you are viewing, select any Tag, and tap on **Edit Tag Value** to make any changes you want for the tag parameter values. (At this point the controller still has the old recipe). Tap on the **Upload to Device** button to transfer the selected (and edited) recipe tag values to the corresponding registers in the controller. Tap on the **Save Recipe** button to save the edited recipe under a new name or under the old name. Tap on the **Download from Device** button to transfer the register values from the controller to the recipe tags. (Tap on the **Save Recipe** button to save the downloaded recipe under a new name or an existing recipe name). Tap on **Done** button to return to the InstantHMI monitor screen.

You may think of a 'Recipe Template' as consisting of all the recipes that share a common recipe definition; that is, they include exactly the same tags from the tag database. InstantHMI maintains the recipe names in sorted order alphabetically. We suggest that you organize your recipes under multiple template names (even if the templates are copies of each other); this will let you keep track of hundreds of recipes with greater ease.

3.6.3 Configurations (PC)

In InstantHMI the definition and management of Configuration parameters is very similar to that of Recipe parameters. The Configuration Manager appears and provides functionality exactly similar to that of the Recipe Manager discussed in detail in Section 3.6.1.

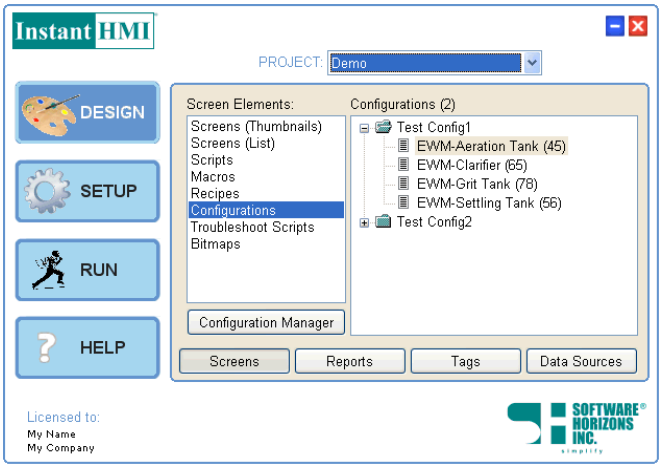


Figure 3-21: Configuration Manager (PC)

3.6.4 Configurations (PDA)

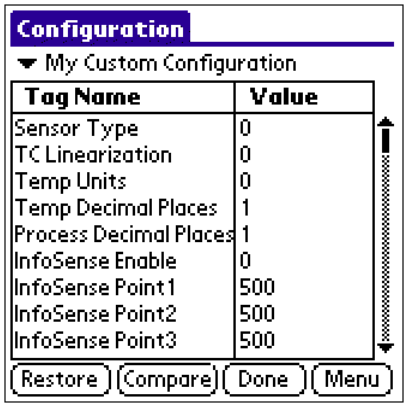


Figure 3-22: Configuration Manager (PDA)

InstantHMI allows you to define a configuration in terms of selected tags from the tag database. Configurations can be saved and given names of your choice. Configuration parameters form one or more controllers can be saved in the PDA, new configurations created in the PDA (or the InstantHMI LaunchPad), and stored configurations could be restored back in controllers.

When you tap on the **Utilities → Configuration** you will see the configuration screen. (Tap on **Setup → Configuration** from OEM Menu Screen). The 'current configuration' in the controller will be monitored and displayed on the PDA.

You may review the Tag Names and associated parameter values and edit the parameter values by tapping on that field. Tap on the **Menu → Save** button to save the configuration under a convenient name. Tap on the **Menu → Delete** button to delete the selected configuration. The unique name 'current configuration' can not be deleted as it will always reflect the current configuration parameters in the controller. Tap on the **Restore** button to transfer the configuration being viewed on the PDA to the controller. Tap on the **Done** button to return to the Menu Screen.

Compare Configurations

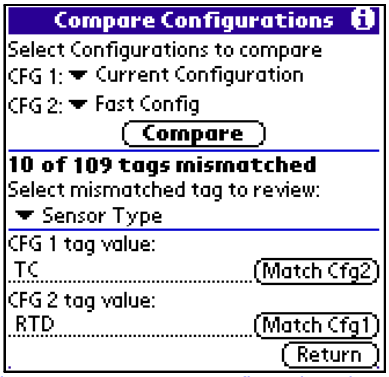


Figure 3-23: Compare Configurations (PDA)

You may compare any two saved configurations. Also, any configuration may be compared with the 'Current Configuration' in the controller. To proceed, select CFG 1 and CFG 2 from the available saved configurations.

Tap on 'Compare' button to compare the two selected configurations. If the two configurations do not match then you will see the number of mismatched tags. Select any mismatched tag from pull down list. Review the associated tag values. You may match a specific tag value from CFG 1 to that for CFG 2 or you may tap on a tag field to enter a new value. You will not be allowed to modify tag values of the 'Current Configuration' (which is meant to reflect the configuration in the controller).

3.6.5 Examples

Example 1: Simple Recipe Scheme

Our application example (See Figure below) involves a batch process which uses 64 parameters stored in a bank of registers R 2101-R2164. To allow for smooth transition from one recipe (that is currently running in the machine) to a new recipe we depend on the operator to confirm that the batch is completed and that the controller is ready to accept a new recipe.

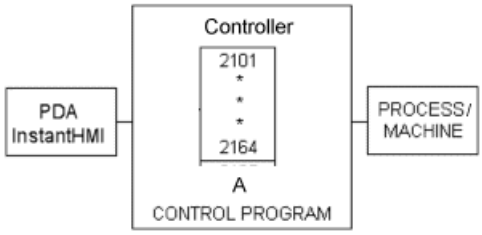


Figure 3-24: Simple Batch Recipe with 64 Tags

Note: In Example 2 below, the use of dual banks of registers and handshaking provides a very safe batch operation. If we can assume that the batch has finished and the operator can safely and directly upload a new recipe from the PDA to the controller, the recipe upload and download can be carried out using a single bank (A) of registers. The handshake register R2165 can be eliminated as well. This simpler scheme is shown in table below.

ACTION	GROUP A R2101-R2164	REMARKS
Download and Save Recipe (Recipe Manager Screen)		
Initially controller is executing a batch process using 'Recipe A' (in register R2101-R2164)	Recipe A	Batch operation (Recipe A) in progress
Tap on Download button to read recipe tag data values from the controller.	Recipe A	
Tap on Save button to save Recipe A.	Recipe A	
Preview Recipe (Recipe Manager Screen)		
Confirm that Batch operation with Recipe A is complete and controller is ready for new recipe	Recipe A	Batch operation with Recipe A is finished.
Select new recipe (Recipe B) in Recipe Manager	Old Recipe A	
Review Recipe B on screen, confirm it is good.	Old Recipe A	
Upload Recipe (Recipe Manager Screen)		
Tap on upload button.	?	
InstantHMI transfers new recipe to controller.	New Recipe B	Batch operation with new Recipe B is ready to start.

Example 2: Complex Recipe Scheme with Safeguards

Our application example (See Figure below) involves a batch process which uses 64 parameters stored in a group (call it Group A) of registers R 2101-R2164. To allow for smooth transition from one recipe (that is currently running in the machine) to a new recipe we use a backup group (call it Group B) of registers R2301-R2364. In addition, each bank will have a hand shake register (R2165 for A and R2365 for B) to signal intentions between InstantHMI running in the PDA and your control program running in the controller.

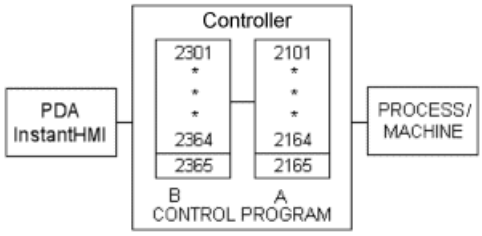


Figure 3-25: Enhanced Batch Recipe with 64 Tags

In this example application we define a single recipe containing 64 tags as shown in the list of tags below.

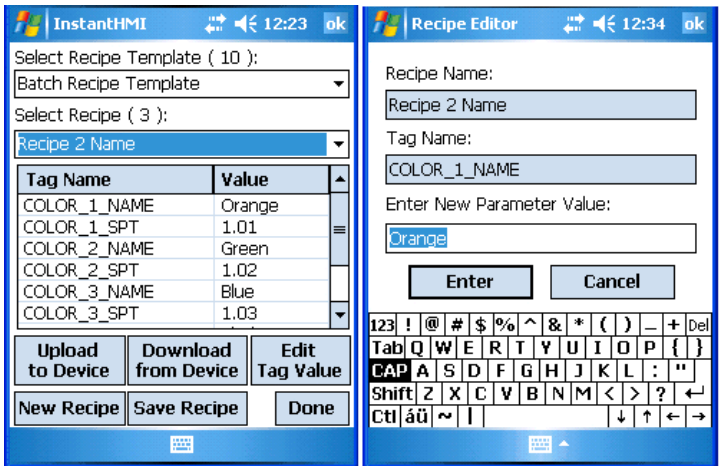


Figure 3-26: Recipe Manager (PDA)

In addition, we include a tag for the handshake register. InstantHMI provides a scrollable list of recipe names so the operator never has to type in the recipe names etc.

The chart below lists the various operator actions and the state of the registers in the controller during the recipe upload, download and save process. Use this chart as a guide to understand the details of the recipe management process and troubleshoot the application.

ACTION	GROUP B		GROUP A		REMARKS
	R2301-R2364	R2365	R2101-R2164	R2165	
Download and Save Recipe (Recipe Manager Screen)					
Initially controller is executing a batch process using 'Recipe A' (in register R2101-R2164)	?	0	Recipe A	0	Batch operation (Recipe A)
Through a screen field, set handshake register R2365 = 2 and wait 100 msec for PLC to complete next step.	?	2	Recipe A	0	"Recipe Save request" signal from InstantHMI to controller control Program
PLC control Program copies Recipe from Group A to Group B. Sets handshake register R2165 and R2365 = 1. Tap on Download button to read recipe tag data values from the controller.	Recipe A	1	Recipe A	1	"Recipe ready to save" signal from controller to InstantHMI (control program will maintain this for about 10 secs).
Tap on Save button to save Recipe A along with the handshake register R2365 (which has value 1).	Recipe A	1	Recipe A	1	
PLC control program resets handshake registers R2165 and R2365 (after 10 secs or so to allow time for saving of recipe by InstantHMI).	?	0	Recipe A	0	
Preview New Recipe (Recipe Manager Screen)					
Select new recipe in Recipe Manager	?	0	Old Recipe A	0	
Review recipe on screen, confirm it is good	?	0	Old Recipe A	0	
Upload Recipe (Recipe Manager Screen)					
Tap on upload button (after reviewing new recipe tag values).	?	0	Old Recipe A	0	
InstantHMI transfers new recipe to controller. (The handshake register R2365 is restored along with the recipe)	New Recipe B	1	Old Recipe A	0	"New recipe" signal from InstantHMI to controller control program
PLC control program transfers new recipe from Group B to Group A when it is ready for the next batch.	New Recipe B	1	New Recipe B	0	
PLC control program resets handshake registers R2165 & R2365	?	0	New Recipe B	0	Batch operation (Recipe B)

Example 3: Configuration of Controllers Using Recipe

The close similarly between Recipes and Configuration sometimes leads to confusion. InstantHMI provides separate function buttons for Recipes and Configuration. Here we will explain how the recipe concept can be used to mimic the configuration of a controller (which is performing as desired) in another similar controller quickly without the need for any tedious parameter setup.

Assume that Controller A (Station # 1) has 64 configuration parameters stored in a bank of registers R2101 – R2164 (similar to Example 1). Save the configuration in a recipe named 'controller configuration A'. Now suppose you wish to setup another Controller B (Station # 3) similar to Station A. The configuration parameters for station B match the functional definition of those in Station A, registers R2101 – R2164. The 64 tags defined for Station A (registers R2101 – R2164) match the corresponding tags defined for Station B, the only difference being the Station # for the two Controllers. The 'controller configuration A' from Station A will have the value 1 for Station #. This Station # must be offset to match the value 3 for Station # of Controller B before transferring the saved 'Controller Configuration A' recipe. This is easily done using the Station Offset parameter included in Data Source part of the tag definition (Sections 3.1):

Station Offset = Station # (Controller B) - Station # (Controller A) = 2.

3.7 Data Logs

3.7.1 Overview of Methods to Log Data in InstantHMI

You may use spooled reports (Section 5.3) as a way of logging data in a text file (use commas or other delimiter to separate variables) which may then be imported into Microsoft Excel or other suitable software for analysis. InstantHMI provides a powerful (optional) feature to support two types of data logging on most platforms: Time based data logging and Event triggered data logging.

You may think of Data Logging as the response to the following conditional statements:

If (**Event1**) then datalog (**Tag List1**),
If (**Event2**) then datalog (**Tag List2**),
etc.

In Time based data logging, the Event is simply defined in terms of datalog Sample Time associated with each tag.

3.7.2 Datalog Database (Old Design – version 6.1.12)

The Database Relationship Model (Enhanced Entity Relationship Model) and Structure (Tables, Relationships, Indexing) discussed here applies to both MS Access and MySQL.

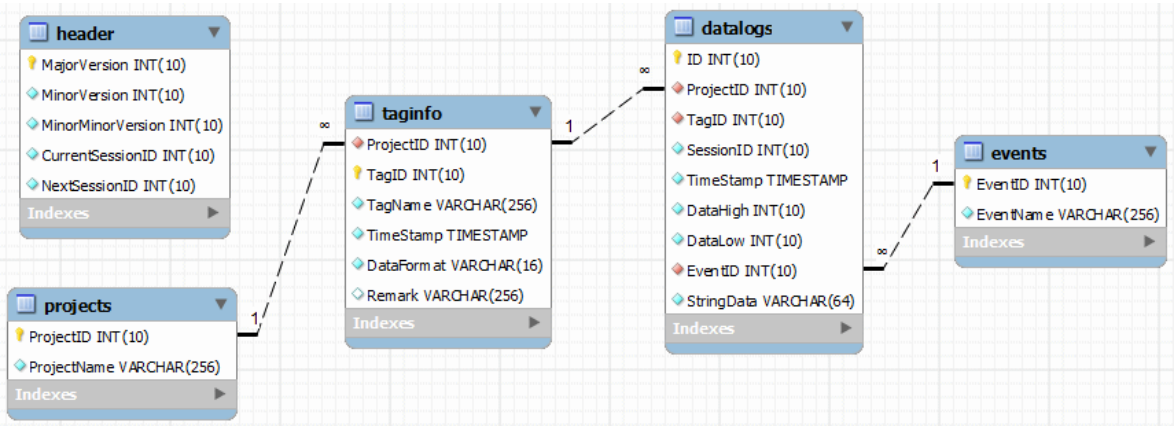


Figure 3-27: Datalog Database Relationship Model

The Datalog Database has five tables with a relationship as indicated above. All Relationships types in the Datalog Database are 'one-to-many' (Example: There can be multiple records with the same ProjectID in the TagInfo table; of course, ProjectID is unique in Projects table). The five Tables are described below.

TABLE <header>: Primary Key - MajorVersion

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI
MajorVersion	INT(10)	☑	☑	☐	☐	☑	☐	☐
MinorVersion	INT(10)	☐	☑	☐	☐	☑	☐	☐
MinorMinorVersion	INT(10)	☐	☑	☐	☐	☑	☐	☐
CurrentSessionID	INT(10)	☐	☑	☐	☐	☑	☐	☐
NextSessionID	INT(10)	☐	☑	☐	☐	☑	☐	☐

TABLE <projects>: Primary Key - ProjectID

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI
ProjectID	INT(10)	☑	☑	☐	☐	☑	☐	☐
ProjectName	VARCHAR(256)	☐	☑	☐	☐	☐	☐	☐

TABLE <events>: Primary Key - EventID

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI
EventID	INT(10)	☑	☑	☐	☐	☑	☐	☐
EventName	VARCHAR(256)	☐	☑	☐	☐	☐	☐	☐

TABLE <taginfo>: Primary Key - TagID

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI
ProjectID	INT(10)	☐	☑	☐	☐	☑	☐	☐
TagID	INT(10)	☑	☑	☐	☐	☑	☐	☐
TagName	VARCHAR(256)	☐	☑	☐	☐	☐	☐	☐
TimeStamp	TIMESTAMP	☐	☑	☐	☐	☐	☐	☐
DataFormat	VARCHAR(16)	☐	☑	☐	☐	☐	☐	☐
Remark	VARCHAR(256)	☐	☐	☐	☐	☐	☐	☐

TABLE <datalogs>: Primary Key - ID

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI
ID	INT(10)	☑	☑	☐	☐	☑	☐	☑
ProjectID	INT(10)	☐	☑	☐	☐	☑	☐	☐
TagID	INT(10)	☐	☑	☐	☐	☑	☐	☐
SessionID	INT(10)	☐	☑	☐	☐	☑	☐	☐
TimeStamp	TIMESTAMP	☐	☑	☐	☐	☐	☐	☐
DataHigh	INT(10)	☐	☑	☐	☐	☑	☐	☐
DataLow	INT(10)	☐	☑	☐	☐	☑	☐	☐
EventID	INT(10)	☐	☑	☐	☐	☑	☐	☐
StringData	VARCHAR(64)	☐	☑	☐	☐	☐	☐	☐

Note: See Section 3.7.13 for New Database design.

3.7.3 Template Database (for Access)

Your standard InstantHMI installation includes a ready-to-use database IHMIDatalog.MDB (as well as a backup database IHMIDatalog-Default.mdb) located in your project directory (usually, C:\IHMI-6\MyProject).

Note: For wider compatibility, IHMIDatalog.mdb is provided (for windows XP SP3 and later). This limits database size to 2 GB. You may create a larger database if your version of Windows (and/or Access) support it. MS Access database function to reduce database size is run when user exits the PC Runtime.

MS Access Database:
(Consult MS Access documentation for details of Database creation etc. For your convenience we provide here concise description of the steps.)
Requirements: MS Access Database Editor
Create Database: 'File' Menu ➔ 'New Database' ➔ Select 'Blank Database' option
Create Tables: 'Tables' Tab ➔ Click 'New' button ➔ Select 'Design View' then 'OK'
Create Primary Key: Right-click on the field that you like to designate as Primary Key and select 'Primary Key' option.
Create Indexes: In table design view click on the Index ( ) icon to add indexes for that table.
Create Relationship: Right-Click in 'Tables' Tab and click 'Relationships...'
To create relationship between tables... Drag the field from one table to another table.

3.7.4 Template Database (for MySQL)

MySQL Database:
Requirements: Install the following (Free Download from www.mysql.com)
MySQL Server: 'mysql-5.5.21-win32.msi'
Workbench: 'mysql-workbench-gpl-5.2.37-win32.msi'
Connector: 'mysql-connector-odbc-5.1.10-win32.msi'
Import provided (IHMIDatalog.sql and IHMIDatalog-Model.mwb) using MySQL workbench.

(Consult MySQL documentation for details of Database creation etc. For your convenience we provide here concise description of the steps.)

Create Database: Create 'New Server Instance', Select 'localhost' and click 'Next'
Give a new 'Connection Name'. Select connection method as 'Standard (TCP/IP)'
Parameters: keep defaults and click 'Next...Next....Next and then Finish'
Create Tables: Open created Server Administration (Database Server Instance). Now Click on 'Data Import/Restore' option from 'Task and Object Browser' pane. Now select second option 'Import from Self-Contained File' to import given .sql file to create database schema. Once selected database imported.... You will see 'ihmi-datalogs' schema.
Create Primary Key + Indexes + Relationship: To create 'Primary Key'... Right-click on table and select 'Alter Table...' option. At the bottom tabs you will see Columns, Indexes, Foreign Keys, Triggers, etc. From the bottom tabs, select 'Indexes' tab to create indexes, etc. In MySQL, foreign Keys will create relationships between tables.

3.7.5 DSN Configuration Setup (MS Access)

The text file Project.Ini in your Project directory (usually **C:\IHMI-6\MyProject**, where MyProject is the name of your project) should have the following lines in the [Setup] section:

Parameter Name	Parameter Key	Parameter Values	Project.ini Section
ODBC DSN	ODBC_DSN	InstantHMI Datalogs	[SETUP]
Database Type	DATABASE_TYPE	Microsoft Access	[SETUP]

We recommend you use the LaunchPad to setup Runtime Options (See Section 2.5.2).

Run the 32-Bit ODBC Administrator on your PC. The discussion below applies to Windows 7, 2000 and XP. The details of the procedure on your Windows OS may differ slightly.

Step 1. Click Start → Setting → Control panel and double click on Administrative tools.

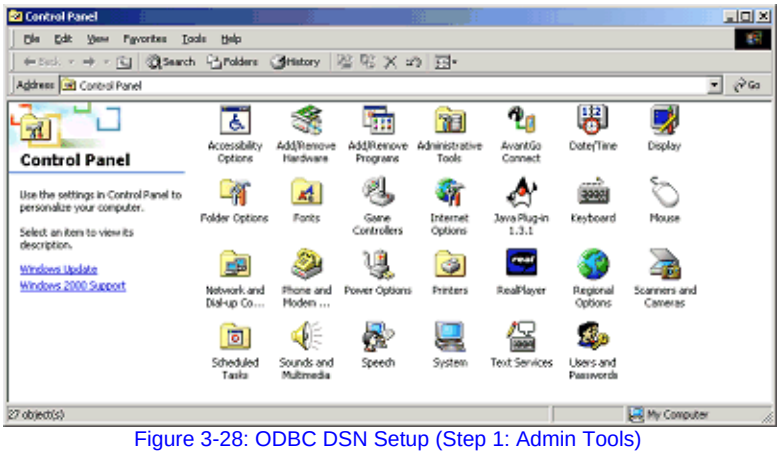


Figure 3-28: ODBC DSN Setup (Step 1: Admin Tools)

Step 2. The Administrative Tools dialog should now appear. Now double click on Data Sources (ODBC).

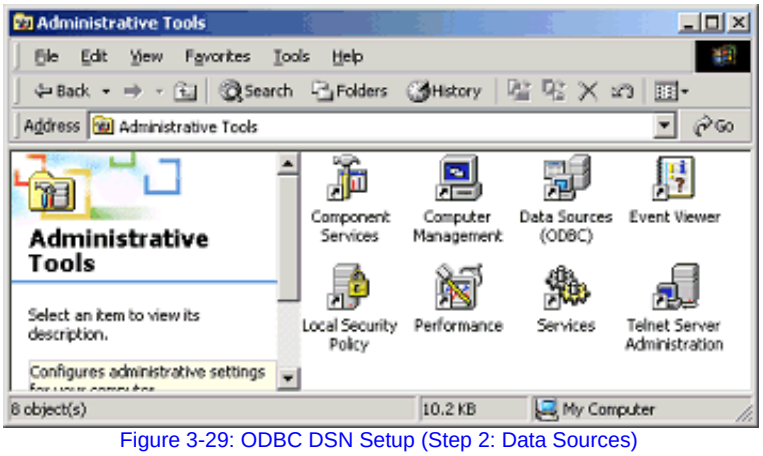


Figure 3-29: ODBC DSN Setup (Step 2: Data Sources)

Step 3. The ODBC Data Source Administrator dialog should now appear.

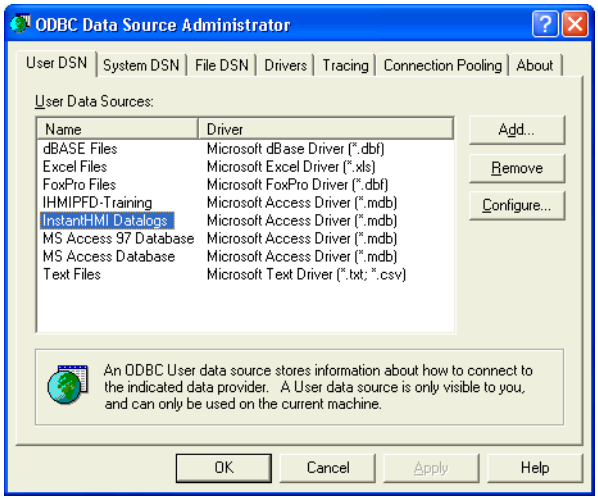


Figure 3-30: ODBC DSN Setup (Step 3: User DSN)

You should see the User DSN tab dialog, if not click the User DSN tab.

Step 4. Next click the Add button. A 'Create New Data Source' dialog box will appear.

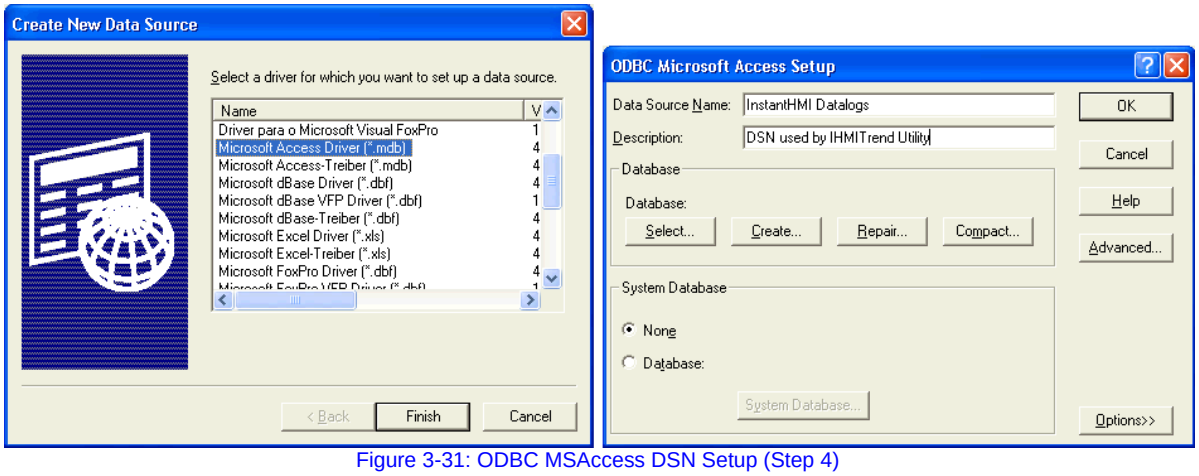


Figure 3-31: ODBC MSAccess DSN Setup (Step 4)

Select the Microsoft Access Driver (*.mdb) and click Finish. A 'ODBC Microsoft Access Setup' dialog box will appear. Enter '**InstantHMI Datalogs**' in the Data Source Name field, and enter '**DSN used by IHMI Trend Utility**' in the Description field, and then click the Select button.

Step 5. Navigate to your IHMI Project Datalog directory (usually, C:\IHMI-6 \MYPROJECT\Datalogs) and select the database IHMIDatalog.MDB and then click OK

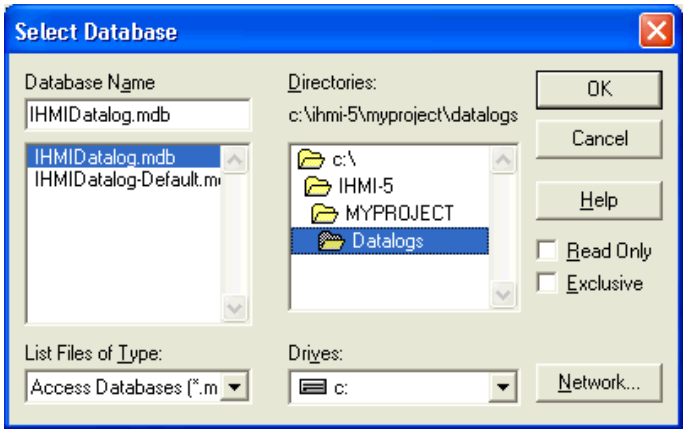


Figure 3-32: ODBC MSAccess DSN Setup (Step 5)

Step 6. Click on 'Options' button in DSN setup and increase Buffer Size to 32768K (should be a multiple of 256K) to improve speed of database access. When you are finished, click OK.

The ODBC MS Access DSN (to be used by Runtime and Historic trending utility) should now be configured properly.

Hints to improve Database performance in Runtime and Historic Trending utility:
Create only required indexing (Example: Index on 'TagID + ProjectID + TimeStamp' in 'datalogs' table). Unnecessary indexing will lead to poor performance as well as larger database size. (Example: 22 tags logged every second for 24hrs will lead to 1 GB size.)

3.7.6 DSN Configuration Setup (MySQL)

The text file Project.Ini in your Project directory (usually **C:\IHMI-6\MyProject**, where MyProject is the name of your project) should have the following lines in the [Setup] section:

Parameter Name	Parameter Key	Parameter Values	Project.ini Section
ODBC DSN	ODBC_DSN	InstantHMI Datalogs	[SETUP]
Database Type	DATABASE_TYPE	MySQL	[SETUP]

We recommend you use the LaunchPad to setup Runtime Options (See Section 2.5.2).

Run the 32-Bit ODBC Administrator on your PC. The discussion below applies to Windows 7, 2000 and XP. The details of the procedure on your Windows OS may differ slightly.

Step 1. Same as for Access DSN Setup (see Section 3.7.5).

Step 2. Same as for Access DSN Setup (see Section 3.7.5).

Step 3. Same as for Access DSN Setup (see Section 3.7.5).

Step 4. Next click the Add button. A 'Create New Data Source' dialog box will appear.

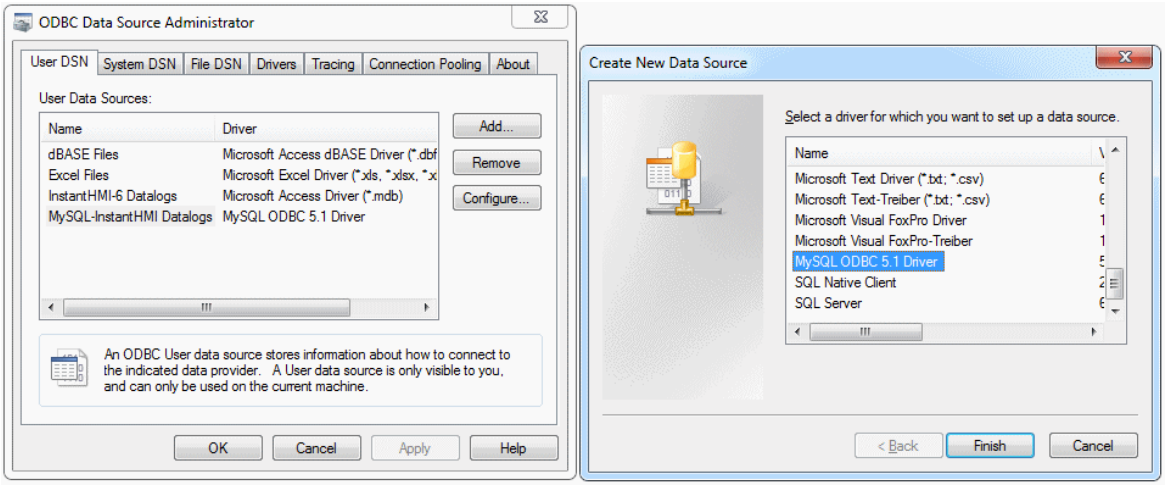


Figure 3-33: ODBC MySQL DSN Setup (Step 4)

Step 5. Select MySQL ODBC 5.1 Driver and click Finish. MySQL Connector Data Source Configuration dialog will appear.

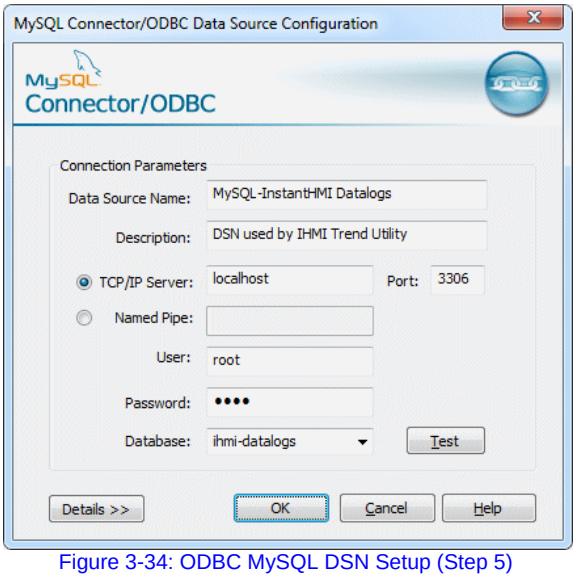


Figure 3-34: ODBC MySQL DSN Setup (Step 5)

Enter the Connection Parameters as shown. You must enter the correct User Name and Password (matching the User Name and Password created while installing MySQL Server, earlier). You will see your MySQL database 'ihmi-datalogs'. Click OK to finish.

The ODBC MySQL DSN (to be used by Runtime and Historic trending utility) should now be configured properly.

Hints to improve Database performance in Runtime and Historic Trending utility:
Create only required indexing (Example: Index on 'TagID + ProjectID + TimeStamp' in 'datalogs' table). Unnecessary indexing will lead to poor performance as well as larger database size.

Note: Foreign key constraints are supported for the **InnoDB** storage engine only. For other storage engines, the foreign key syntax is correctly parsed but not implemented.

3.7.7 Data Log Triggers

Time Driven
Example: Data log Tag Value (for each tag marked for datalogging) at specified sample time

3.7.8 Time Based Data Logging

Any tags from the tag database may be assigned a Datalog Sample Time (Sections 3.3.3 and 3.3.7). To setup time-driven data logging, click the Log to Database check box in the Tag Editor dialog box if you wish to log the data in a monitored data field. When using a PC runtime engine, the datalog will be saved in an ODBC compatible database IHMIDatalog.mdb. When using a PDA or Win CE runtime engine, the datalog will be saved in a format compatible with the specific platform, which can then be converted using the PC LaunchPad to the ODBC compatible database IHMIDatalog.mdb (as well as a .CSV file, in some cases). The IHMIDatalog.mdb database may be used for historical trending (Section 13) or other analysis using tools (such as Microsoft Access) available to you. You may select the logging interval. Specifying a smaller datalog sample time will cause data to be logged more frequently; a higher sample time leads to the tag value to be logged less frequently. Note that your copy of InstantHMI LaunchPad must have the Historical trending option installed for the logged data to be useful for trending analysis.

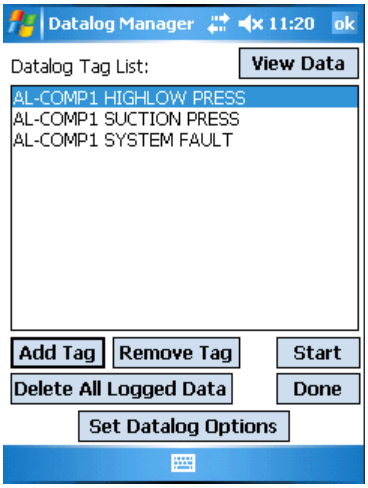


Figure 3-35: Datalog Manager (PDA)

Note: On a PDA you can access the Data Log Manager at runtime. This enables you to decide to log data on the fly. Use the **Data Log** button/menu from the Main Menu to display the Data Log Manager screen. Tap the **Add Tag** button, to include any selected tag data items defined from the Tag database in the data log tag list for logging (in the PDA) at specified sample times. Tap the **Remove Tag** button to delete an item from the data log tag list. Tap the **Done** button to leave the Data Log Manager screen. You may tap the **Start / Stop** button to start / stop the logging of data (in the PDA). If the button label shows 'Stop', you may tap it to stop data logging in progress. If the button label shows 'Start', you may tap it to start data logging. Tap **Delete All Logged Data** to delete all logged data from the database. Tap the **View Data** button to view the logged data.

Datalog by exception This feature can be turned on and then using a deadband > 0.0 avoids logging repeated tag values. We have provided an 'Upper Deadband' and a 'Lower Deadband' in the TagInfo table in the database. Data will be logged only if new data value falls outside the deadband with respect to the old data; that is,

new data > old data + upper dead band, or
new data < old data - lower dead band.

Note that you may set either dead band = 0.0. If Dtalog by Exception is turned off then every sample will be logged (without exception) even if data value is constant (repeated). Shown here is an example Tag (Cos 1), whose value will be logged only if it changes by more than +/- 0.01.

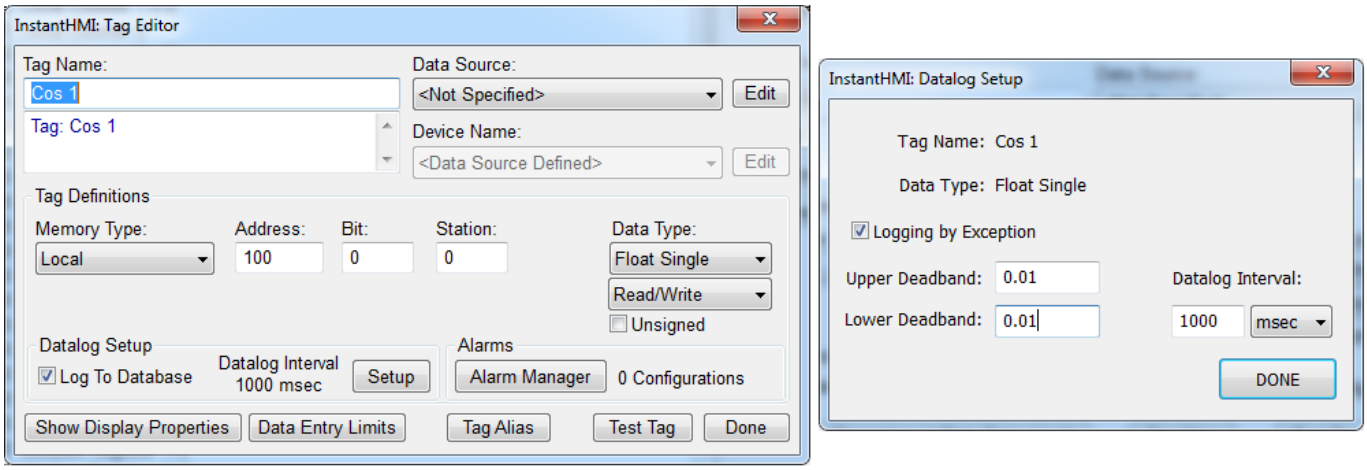


Figure 3-36: Datalogging by Exception

3.7.9 Event Triggered Data Logging

Event triggered data logging is illustrated by an example below.

Example: General event triggered data logging
Suppose you have a tag called Temperature with a high value THigh and a low value TLow and you wish to log Temperature values if it is in high alarm condition (Temperature > THigh) or in low alarm condition (Temperature < TLow). You define Event1, with Trigger Tag as Temperature and Trigger value = THigh, Trigger Type = Transition On, Data Logging Method = Log Continuous, and include the Temperature tag in the Tags to Log list. You also define Event2, with Trigger Tag as Temperature and Trigger value = TLow, Trigger Type = Transition Off, Data Logging Method = Log Continuous, and include the Temperature tag in the Tags to Log list. Finally, you choose both Event1 and Event2 as Datalog Trigger Events. This will ensure that the Temperature tag will be logged whenever it is in (high or low) alarm condition.

Note: If consecutive comm errors occur triggering the 'stop logging tag' message for a tag on a realtime/historic trend, the tag will still be monitored but not logged. Upon a subsequent successful communication, the tag will be added back to the datalog list.

Datalog Events are included as one of the project elements. To access Datalog Events, click on LaunchPad → Design → Tags and select Datalog Events in the Tag Elements column, select a datalog event (if available) from the Datalog Events pre-view panel and then click on the **Datalog Events** button to define the datalog event triggers.

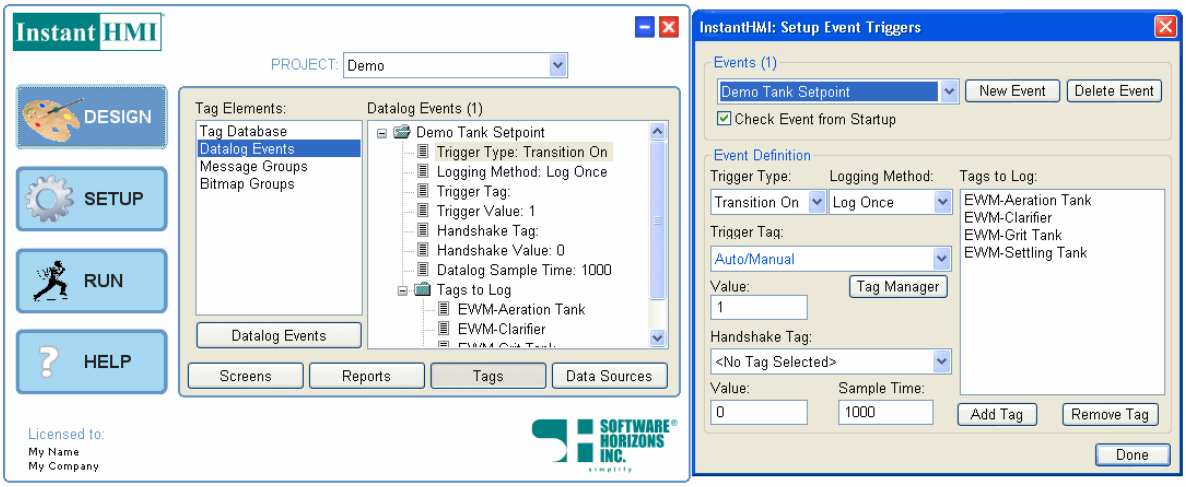


Figure 3-37: Datalog Event Manager (PC)

InstantHMI provides a 'Setup Event Triggers' dialog, which allows you to define one or more Event Triggers. Tap on 'New Event' button in this dialog and enter a new Event Trigger name (such as Etch Setpoint, shown in the figure). For each event trigger, you may select a Trigger Tag and an associated Trigger Value. The 'On (True)' condition is defined for the Trigger Tag when its data value exceeds the Trigger Value, otherwise the Trigger Tag is in the 'Off (False)' condition. You have a choice of two Trigger Types: Transition On (when the Trigger Tag enters its On state) and Transition Off (when the Trigger Tag enters its Off state). You also have two Data logging Methods: Log Once on Trigger condition (On or Off), Log Continuously as long as trigger condition (On state or Off state) persists. In addition, you may select one or more tags (Tags to Log List) to be logged when the trigger event happens. If defined, the Runtime engine will use the Handshake tag to signal the controller that data logging is done for the event. Once you have 'Setup Events' for data logging, you may specify which (if any, some, or all) of the defined trigger events will be used as Datalog Trigger Events during the current run of InstantHMI. The Events are saved in a database IHDLEvents.IDB and may be deployed on the runtime platform (PC or PDA or WIN CE).

You may also setup datalog trigger events directly on the PDA as shown below.

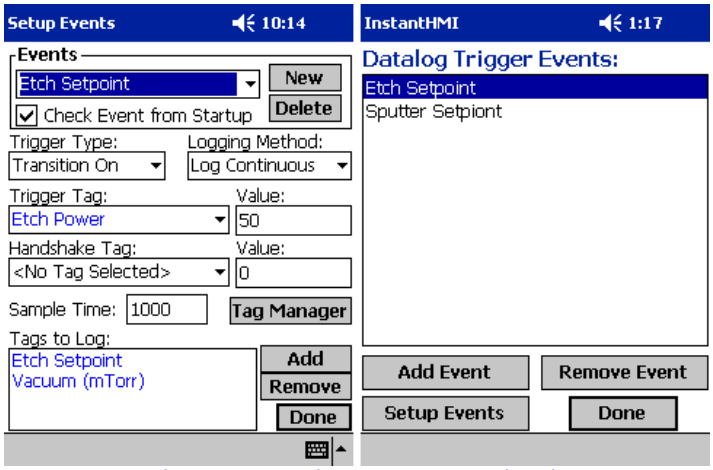


Figure 3-38: Datalog Event Manager (PDA)

3.7.10 Event Trigger using Task Scheduled Script or Macro

See Task Scheduler (Section 16) and setup an Even Trigger to suit your requirement.

3.7.11 Viewing Logged Data

When using a PC runtime engine, the datalog will be saved in a Database depending on the DSN (Access database IHMIDatalog.MDB or MySQL). When using a PDA or Win CE runtime engine, the

datalogs will be saved in datalog files for each tag (TagName.idb), which can then be converted using the PC LaunchPad to the datalog database depending on the DSN (Access database IHMIDatalog.MDB or MySQL) (as well as a .CSV file, in some cases). The Datalog database may be used for historical trending using on-line plot history (see Plot widget in Section 4.11.5) or off-line historic trending module (Section 13) or subject to other analysis using tools available to you. Note that your copy of InstantHMI LaunchPad must have the Datalogging and/or Historical trending option installed for the logged data to be useful for trending analysis.

On a PDA, to view the logged data, tap on the **View Data** button on the Data Log Manager screen (Section 3.7.8). You will see a scrollable table listing the data logged for the selected tag. Tap the pull down list of Tags to select a tag from the list of tags for which data has been logged. Use the scroll bar on the right to browse through the table (tapping the arrow scrolls the table one line at a time, tapping the scroll bar scrolls the table one page at a time). Tap the **Delete Tag Data** button to delete the logged data for the selected tag. Tap the **Done** button when you are done viewing the data log.

The logged data is saved in the runtime engine. The logged data may be transferred to a desktop PC (using the InstantHMI LaunchPad software) and after transfer to the LaunchPad platform it is saved in the database InstantHMI.MDB and/or a .CSV file. The transferred data can be subjected to analysis using Microsoft Excel, companion tools (such as Historic Trending, Section 13) or other tools available to you.

3.7.12 Viewing Database Error Log

Normally, everything goes as planned and you will be viewing logged data as described in Section 3.7.11. If something goes wrong while logging data, the system generates errors which are logged in the text file 'IHMI-DatalogErrors.log'. An example of an error logged is as follows:

05/02/2012 10:45:00 Connection to the Data Source failed

The content of the log file (may be too technical and) is meant to help your System Administrators and/or Software Horizons to help diagnose any unforeseen problems.

3.7.13 Datalog Database (New Design – version 6.1.22)

The main motivation for a new data base design is to accommodate a large number of Datalog records in the database. We will illustrate with two examples.

Example 1: Customer A Requirement for 1 Month's data

Total Datalog Tags : 70
Tag Sample Rate : 20 Tags Every Second, 50 Tags Every 30 Seconds

Calculation for 1 month of Datalog records (30 x 24 x 60 = 43200 Minutes)

20 Tags (Every Second) : Total Records → 43200 x 20 x 60 = 51,840,000 Records
50 Tags (Every 30 Seconds) : Total Records → 43200 x 50 x 2 = 4,320,000 Records

---

Total Datalog Records in Database = **56,160,000 Records**

Access 2003 (and earlier) supports only 1 GB database size. Access 2007 (and later) supports 2 GB database size. With Old database design, 2 GB Compacted database could hold only 30,250,196 Records.

Note: You can setup max database size in LaunchPad through Runtime Option (Section 9.4). Runtime will take care of backing up Datalog Database if database size exceeds that limit. (Implemented for only Access database which may be limited to 2GB max size.)

In order to meet customer requirement of 1 month's data, we redesigned the Datalog database (6.1.12 = OLD Datalog database, 6.1.22 = NEW Datalog database). Notice the simpler design, elimination of unnecessary fields, Datalog table customized for each data format (Byte, Int16, …), and elimination of unwanted indexes.

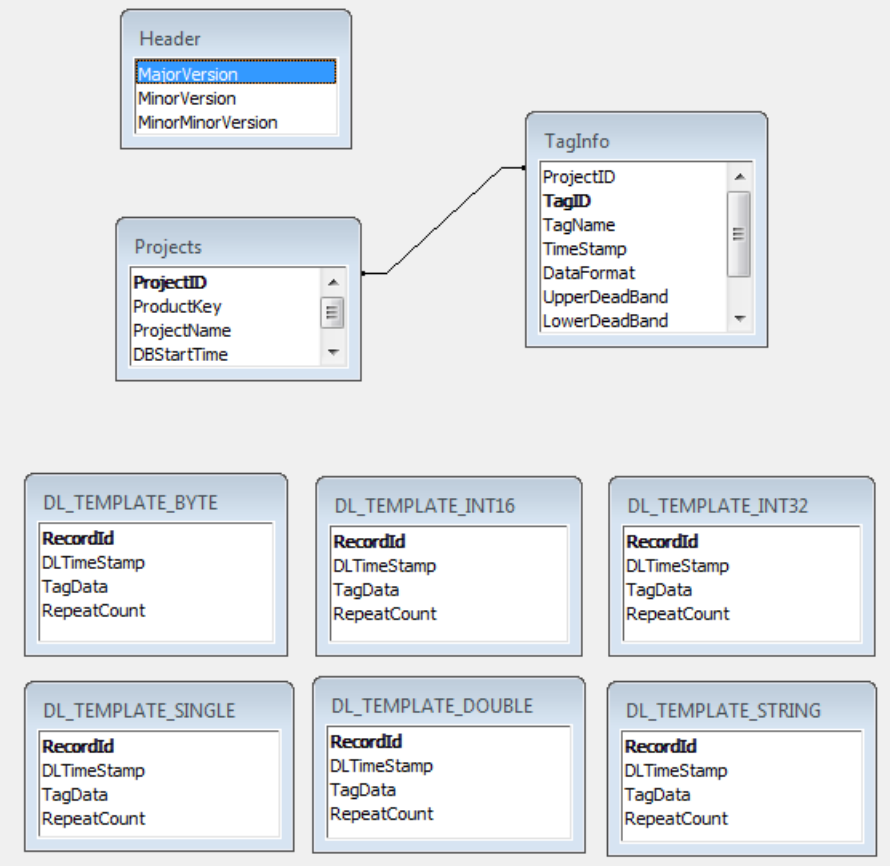


Figure 3-39: Datalog Database version 6.1.22

Name	Size
IHMIDatalog-35M Records.mdb	769,024 KB
IHMIDatalog-53M Records.mdb	1,143,560 KB

Figure 3-40: Sample Datalog Database Sizes and Number of Records

Based on our testing, our New Datalog database needs about 22 MB per million records, or about 1.2 GB for 56 million records, or 1 month worth of data.

Example 2: Customer B Requirement for 1 Month's data

Total Datalog Tags : 100
Tag Sample Rate : 100 Tags Every Second

Calculation for 1 month of Datalog records (30 x 24 x 60 = 43200 Minutes)
100 Tags (Every Second) : Total Records → 43200 x 100 x 60 = **259,200,000** Records

Based on our testing, our New Datalog database needs about 22 MB per million records, or 5.7 GB for 1 month. This will exceed the 2 GB limitation of Access 2007. To get around this system limitation, we will need to choose a sample time that is larger than 1 sec or Datalog by exception using a deadband > 0.0 (to avoid logging repeated tag values) or both. We have provided an 'Upper Deadband' and a 'Lower Deadband' in the TagInfo table in the database. Data will be logged only if new data value falls outside the deadband with respect to the old data; that is,

new data > old data + upper dead band, or
new data < old data - lower dead band.

Note that you may set either dead band = 0.0. If Dtalog by Exception is turned off then every sample will be logged (without exception) even if data value is constant (repeated).

3.8 Alarm Configuration Database and Alarm Logs

The database is stored in IHMI-AlarmConfigDB.idb starting with version 6.x. Prior to that, a much limited alarm configuration information was included with the associated tag in the Tag database IHMI-TagDB.idb. The alarm config information from the tag database prior to version 6.x will be automatically resaved in IHMI-AlarmConfigDB.idb. (See Section 17 on Alarm Management for detailed discussion of alarm configuration). In Runtime, you can right click to pop-up runtime menu and then select 'Reports -> Logs -> Alarm Log' to access 'Alarm Log File'. You can also configure Alarm annunciation to print an alarm log record on a selected printer.

3.9 Database Info

InstantHMI maintains information about tags, messages etc. in databases. Each database has a header record which contains information such as Creation Date, Last Modified Date, Password required to read database, Password required to edit database etc. The crucial Passwords to read/edit the database can be assigned by the Owner /Administrator/OEM of the database using appropriate password.

In the Screen Designer, click on **Tag Data → Tag Manager** to design, edit and manage the tag database to suit your project needs. You will see the Tag Manager dialog box showing a tree structure displaying all the defined tags and tag groups in your tag database. Buttons are provided to access Database Functions, tag Group Functions and Tag Functions. Click the **Database Info** button to see the Database Info and for the password protection of Database contents from editing by unauthorized persons.

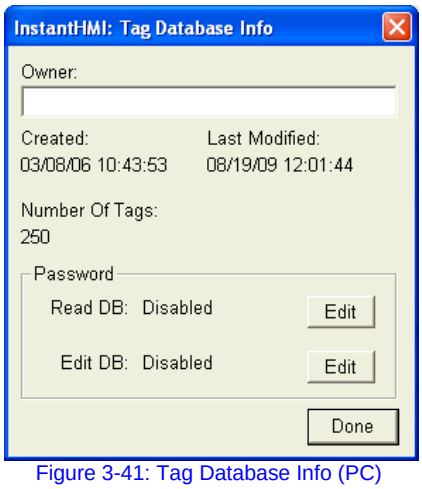


Figure 3-41: Tag Database Info (PC)

On a PDA platform, when you tap on the **Main Menu → Setup → Database Info** you will see a pop-up dialog Box.

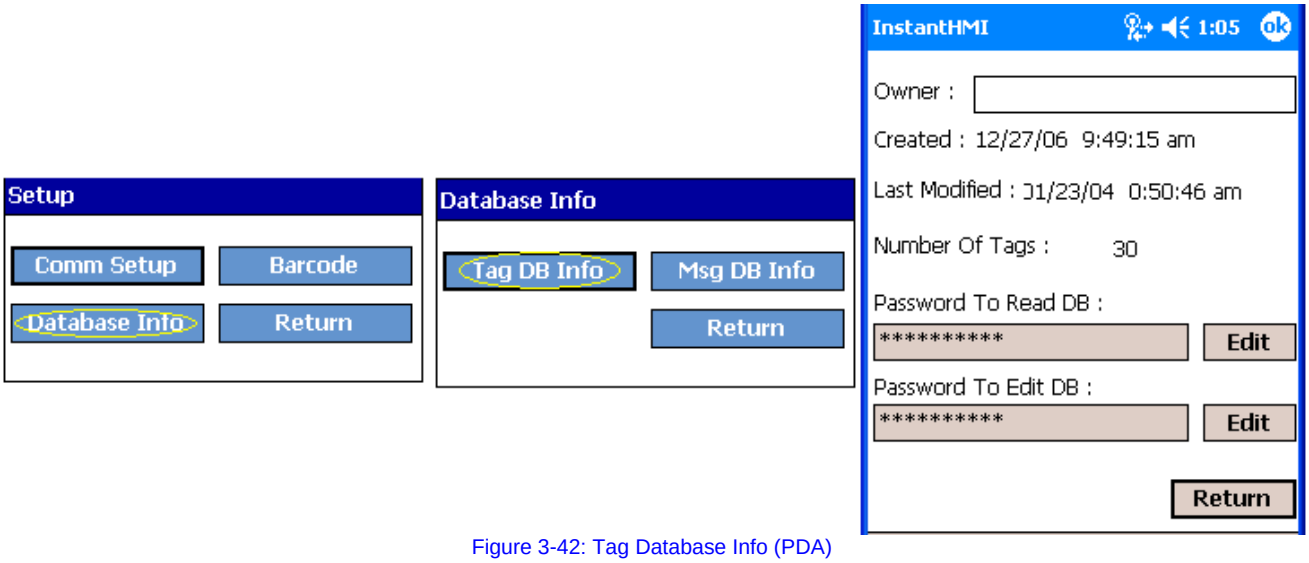


Figure 3-42: Tag Database Info (PDA)

Tap on the **Tag DB Info** button to access the header record. You may change the Read/Edit passwords by tapping on the Edit button. For the old password enter the previous password or a higher level password with authorization to change the database header record. After entering the Read/Edit Passwords, tap on **Save** to make the changes or **Cancel** to discard the changes.

Tap on **Msg DB Info** to access Message Database header record exactly as in Tag DB Info.

4 Screen Designer

Use the Screen Designer to create your application project including all your Application screens, operator help screens and Macro / Script elements attached to your screen objects. Use Screen Designer also for defining data sources, modifying setup parameters, passwords, recipe control flags, data entry order, and for TCP/IP links with other nodes running InstantHMI runtime engine. Note: InstantHMI 6.1 and later support Graphical Report Templates designed in Screen Designer.

4.1 Getting Started

Click on the **Design → Screens** command button on the LaunchPad (Section 2) for an overview of your project screens in the LaunchPad. Click on Screen Designer button or double click on any screen pre-view to view and edit it in the Screen Designer (Figure 4-1). You may also double click on the 'New Screen' or right click on any screen pre-view and then click on the New Screen or Edit Screen menu to run the Screen Designer.

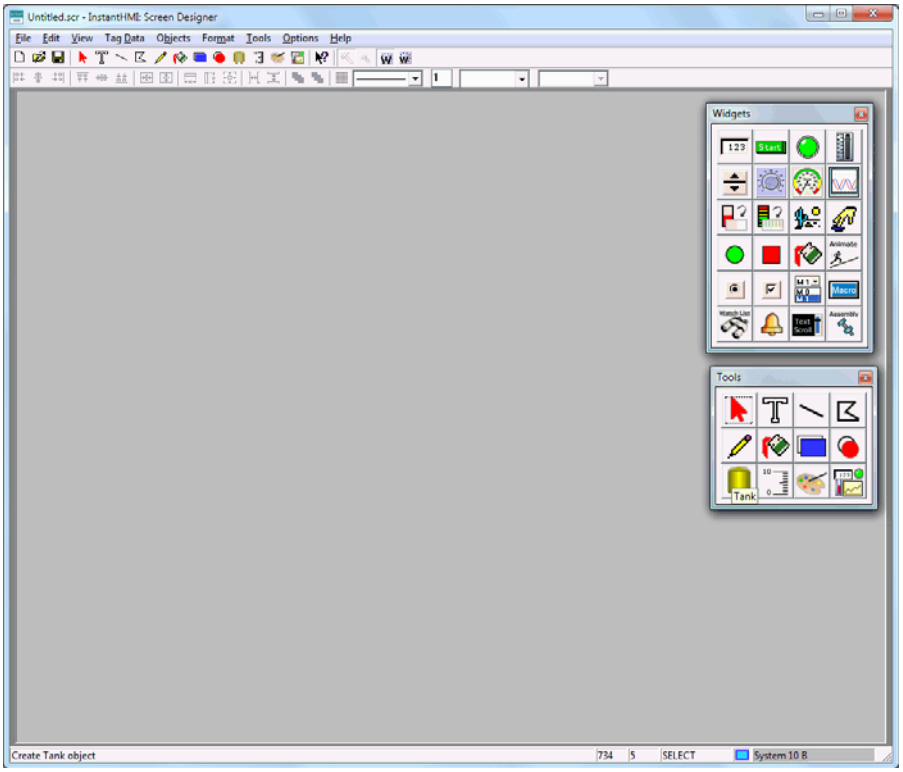


Figure 4-1: Screen Designer Window

You will be working with your screen in the **Design Area** of the Screen Designer window using the Menu Bar (Section 4.1.5). This window also has a Title Bar at the top (Section 4.1.1) and a Status Bar at the bottom (Section 4.1.2). A Tool Bar and a Style Bar are also provided below the Menu Bar (in the Design Area) for direct short cut access to some of the frequently used menu items (Section 4.1.3). In addition, a re-sizable (Figure 4-1, Figure 4-2) Tool Palette and Widget Palette are provided. The Screen Designer window View is customizable by you. For example, you may use the View menu to turn off the visibility of the Tool Bar, Style Bar, Tool Palette and Widget Palette, leaving the entire Design Area of the Screen Designer window exposed. You may skip over the discussion in Section 4.1.1 if you are familiar with other Windows programs, it is included here for reference purposes. s.

Note: InstantHMI implements a "*Design Once, Deploy Anywhere*" HMI solution. This will allow you to design your HMI project screens on a Windows PC platform, and deploy it on any Windows PC, or PDA (Windows Mobile or Pocket PC), or Windows CE platform, which has an installed InstantHMI

Runtime engine. When the target platform is not a Windows PC (for example, Pocket PC with a resolution of 240 x 320) the Design Area for your screen will be restricted to match the target platform size. You will be allowed to convert a screen designed for a different platform to the current project platform; the resulting screen may or may not be to your liking depending on the transformation required for the conversion. Feel free to edit the resulting screen or create a new screen for the current platform. The PC platform screens are named *.scr and all other platform screens are named as *.iscr.

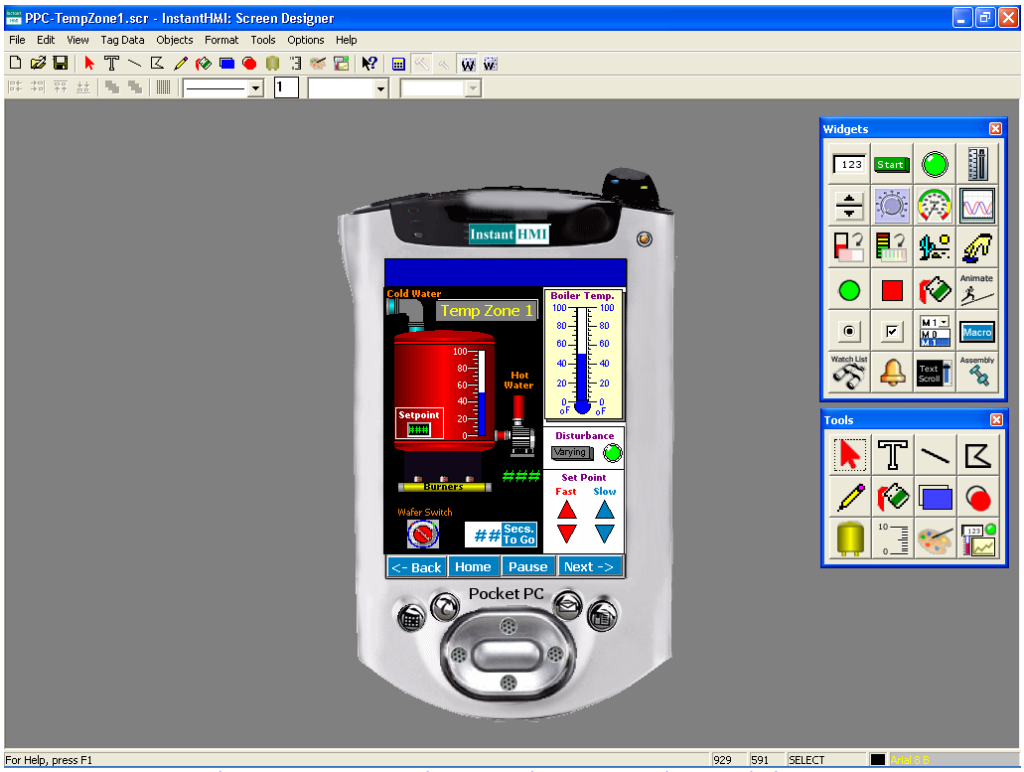


Figure 4-2: Screen Designer - Design Area - Pocket PC Platform

4.1.1 Title Bar

The title bar is located along the top of the Screen Designer design window. To move the window, drag the title bar. A maximized window cannot be moved or resized. Note: You can also move dialog boxes by dragging their title bars.

Screen Designer window title bar contains the following elements:

- Program Control-menu button (Screen Designer Icon)
- Name of the Screen File
- Name of the Program (InstantHMI: Screen Designer)
- Minimize button
- Maximize/Restore button
- Close button

When you click on the Control Menu button (Screen Designer Icon) on the title bar you will see a pull down menu of six options:

Restore (Control Menu)
Use this command to return the active window to its size and position before you chose the Maximize or Minimize command.

Move (Control Menu)
Use this command to display a four-headed arrow so you can move the active window or dialog box with the arrow keys. Press the Enter key after moving the window to desired position. This command is not available if you maximize the window.

Size (Control Menu)
Use this command to display a four-headed arrow so you can size the active window with the arrow keys. After the pointer changes to the four-headed arrow:

- Press one of the Direction keys (left, right, up, or down arrow key) to move the pointer to the border you want to move.
- Press a Direction key to move the border.
- Press Enter when the window is the size you want.

This command is not available if you maximize the window. You may also use the mouse and drag the size bars at the corners or edges of the window.

Minimize (Control Menu)
Use this command to reduce the Screen Designer window to a task button on the task bar. You may also click the Minimize button on the title bar.

Maximize (Control Menu)
Use this command to enlarge the active window to fill the available space. Click the maximize icon on the title bar or double-click the title bar.

Close (Control Menu)
Use this command to close the active window or dialog box. Double-clicking a Control-menu box is the same as choosing the Close command. ALT + F4 closes the Screen Designer window or dialog box.

4.1.2 Status Bar

The status bar is displayed at the bottom of the Screen Designer design area whenever it is enabled in the View menu.

Figure 4-3: Screen Designer - Status Bar

The Command Prompt area of the status bar describes actions of menu items as you use the arrow keys to navigate through menus. If after viewing the description of the command you do not wish to execute the command, then release the mouse button while the pointer is off the command. The XPOS and YPOS panes (areas) identify the mouse cursor position. The Object pane shows the currently chosen object or tool. The pane to the right of object pane shows a filled box whose border is the current Pen Color and whose interior is the current Fill Color. The rightmost pane shows the text Font & Color.

4.1.3 Tool Bar

The Tool bar is usually displayed across the top of the Screen Designer window, below the Menu bar. You may hide the tool bar using the View Tool bar menu. The tool bar buttons provide short cuts to some of the more commonly used menu commands as shown.

A Tool Palette that includes commonly used tools from the Tool Bar is also provided for your convenience in screen creation. You may select large or small size Tool Palette window and move it to any part of the design screen.

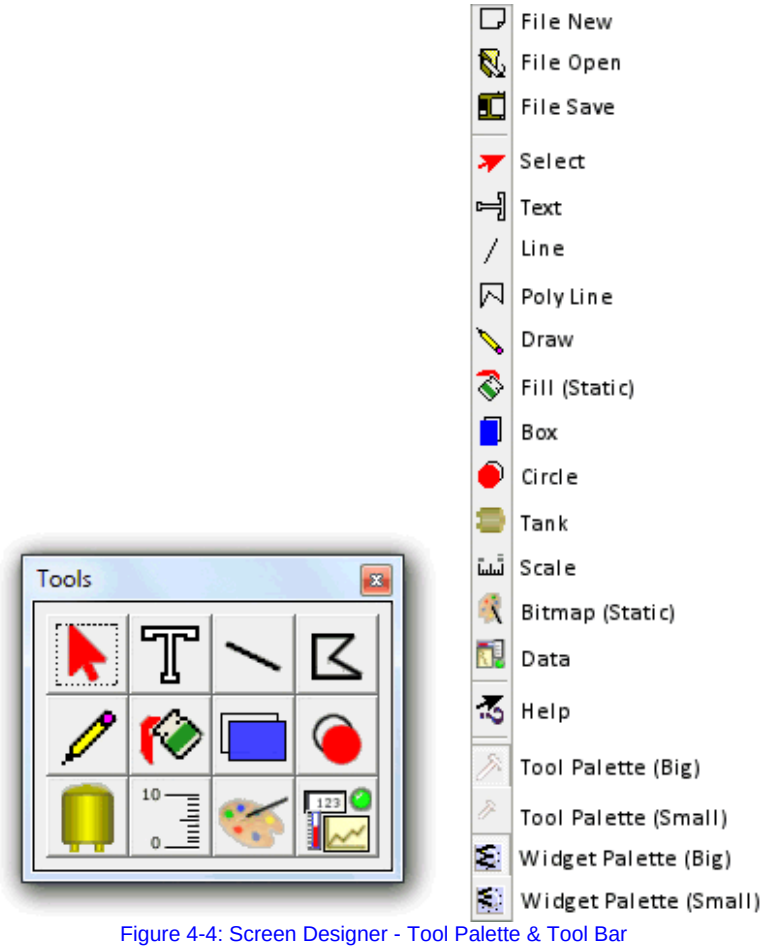


Figure 4-4: Screen Designer - Tool Palette & Tool Bar

4.1.4 Style Bar

The Style bar groups together some editing tools for your convenience.

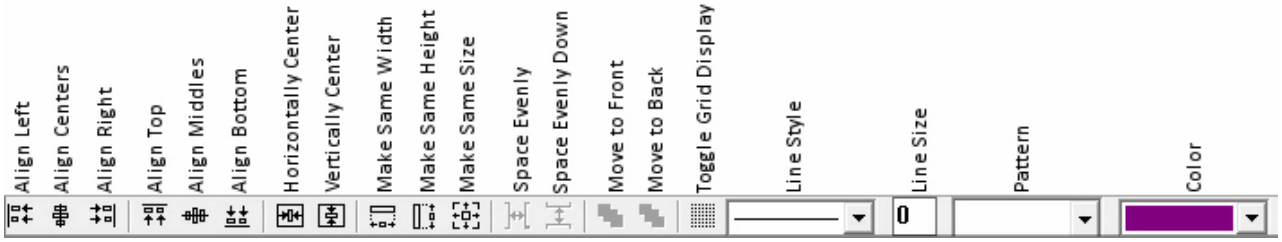


Figure 4-5: Screen Designer - Style Bar

The Alignment and Sizing Tools allow you to re-arrange and/or re-size objects on screen. For example, if you select three Box objects on screen and then click on Align Left, then the first two boxes will be moved on screen so that their left side aligns with the left side of the third box.

Aligning a group of objects: Select the objects you want to align. Select the object that you want to be the dominant one last (indicated by its selector/sizer boxes being filled, all other object selector boxes will be hollow). The final position/size of the group of objects, after executing the alignment or sizing command, depends on the position/size of the dominant object. From the **Edit** menu, choose **Arrange Objects**, and then choose one of the following alignments:

Align Left: aligns the selected objects along their left sides.
Align Centers: aligns the selected objects horizontally along their center points.
Align Right: aligns the selected objects along their right sides.
Align Top: aligns the selected objects along their top edges.

Align Middles: aligns the selected objects vertically along their middle points.
Align Bottom: aligns the selected objects along their bottom edges.

Centering Objects on Screen: Select the objects you want to rearrange. From the Edit menu, choose Arrange Objects, and then choose one of the following:

Center Horizontally On Screen: centers objects horizontally in the design area of the screen.
Center Vertically On Screen: centers objects vertically in the design area of the screen.

Resizing a group of objects: You can resize a group of objects based on the size of the dominant object. To make objects the same width, height, or size select the objects you want to resize. As before, the object selected last is the dominant object. The final size of the objects in the group depends on the size of the dominant object. From the **Edit** menu, choose **Arrange Objects**, then choose one of the following commands:

Make Same Width: Width of all objects will be changed to match that of the dominant object.
Make Same Height: Height of all objects will be changed to match that of the dominant object.
Make Same Size: Height and Width of all objects will be changed to match that of the dominant object.

Spacing Between Objects: The Screen Designer enables you to space objects evenly between the outermost objects selected. Select the objects you want to rearrange. From the Edit menu, choose Arrange Objects and then choose one of the following:

Space Evenly Across: spaces objects evenly between the leftmost and the rightmost object selected.
Space Evenly Down: spaces objects evenly between the topmost and the bottommost object selected.

Other Tools: When two objects are overlapping then you may select one of them and click on the Move to Front or Move to Back tool to achieve the desired effect. These tools are helpful when you decide to draw an object underneath another object already on screen.

The Toggle Grid display tool is used to turn on or turn off grid display on screen to help you during the screen creation process. The Line Style and Line Size tools are used to set the line style and size of a selected object on screen.

The Fill Pattern tool is used to change the fill pattern of the selected object on screen. The Color tool is used to change the predominant color (border or fill depending on the object) of the selected object.

4.1.5 Menu Bar (Main Menu)

The menu bar lists the main menu commands which are discussed in detail in Sections 4.2 - 4.10.

File	See Section 4.2
Edit	See Section 4.3
View	See Section 4.4
Tag Data	See Section 4.5
Objects	See Section 4.6
Format	See Section 4.7
Tools	See Section 4.8
Options	See Section 4.9
Help	See Section 4.10

You may select any menu command by pointing to it with the mouse and clicking the left button. You may de-select any menu command by clicking on it again or by pressing the Alt key.

4.1.6 Creating Application Screens

A Thumb Nail Sketch

The Screen Designer includes four features (Data Viewer, Watch List, Screen Capture, and Object Assemblies) which facilitate rapid creation of your project screens.

Step 1: Use the **Data Viewer** feature to automatically create tags; pre-test the tags for proper communication with your controller if desired. Here you may transfer the automatically created tags to the tag database. The tag names can be edited to suit your own naming preferences, as well as assigned to convenient Tag Groups. The **Watch List** object allows you to monitor and/or modify tags from your Tag Groups at Runtime.

Step 2: Use the **Image Capture** feature to import any images (bitmaps, jpeg, gif or png) that you wish to place on the application screens to enhance operator familiarity.

Step 3: Use the **Object Assembly** feature to build functional objects for placing on screen. These named object assemblies (stored in a library of object assemblies) may include re-sizable collection of active widgets, touch zones, and static objects. They also allow for dynamic association with multiple tag groups at Runtime, as well as Pop-up/Hide Windows.

Step 4: Use the other LaunchPad utilities to define other project elements as desired.

Details

Use the Screen Designer main menu and other menu commands or the Tool Bar buttons or the Widget Palette to create your screen. The Status Bar will provide instantaneous feed back. Use the context sensitive help by pressing the help key F1 after highlighting any menu item; this will tell you about the menu item selected.

To modify an existing application screen, use the File, Open option to retrieve your screen. Use Select tool from the Tool palette and click on any object to select it. You may also drag a box to select a block of (multiple) objects contained within the box. The Edit menu is used to Copy, Move or Delete the selected block of objects; you may also Save selected objects as an Object Assembly for re-use in other screens. Use any of the options from the Objects menu to add new objects (such as Text, Box, Line etc.) to your screen. The Grid option from the View menu is used to set the size of the snap grid. Use the Format menu to dress up your objects as desired.

The Objects → Data Object menu is utilized to include data items on your screen to enable you to enter data through the screen or monitor data on screen at runtime. The Tabbing Order from the Options menu allows you to set your own tabbing order for data entry fields.
Screen Designer uses many distinct mouse cursors; each including a pointer with an object attached depending on the tool selected. The tip of the arrow indicates mouse positions in the design area of the screen. A simple arrow is used to select objects and to indicate Menu choices. At start the default cursor, selected by you, will appear in the design area and its position will be indicated on the Status Bar.

Screen Creation Process Summary

Create Text and Graphic Objects

Use the Status Bar as a guide to position the cursor on the screen at any specific x, y coordinates. Status Bar shows the object selected. Use the Main Menu Object choices or the Tool Palette or the Tool Bar buttons to enter Text, draw Box, Line, Circles, etc. and obtain the desired layout for the screen.

Create OI-Widgets and other Data Objects

Pick and place widgets from the Widgets Palette or use the Objects → Data Object or Objects → Object Assembly menu to define data fields on your screen and tie them to your PLC or other I/O devices supported by InstantHMI. You may also choose the Objects → Touch Zone menu to define touch zones on the screen. You may right click and Test Object or Test (entire) Screen for communication (if your controller is connected).

Test Objects and Screen
Right click on screen and select Test Object or Test Screen in Screen Designer.

Save Screen and Exit
Use the File → Save option to save your screen. Use the File → Exit option to exit the program.

4.2 File

The File menu offers the following commands:

New...	Create new application screen.
Open...	Open existing application screen. (PgUp/PgDn opens Next/Previous application screen)
Save...	Save currently open application screen using same file name.
SaveAs...	Save currently open application screen using different file name.
Recent File	Not used
Exit	Exit Screen Designer program.

File → New (Ctrl + N)
Use this command to create a new application screen in Screen Designer. Be sure to save the current application screen if you want to preserve any changes. If you have not saved your application screen, a dialog box will pop up prompting you to save. After you choose Yes or No, a blank (new) screen is presented.

File → Open (Ctrl + O)
Use this command to open an existing application screen. You will see a File Open Dialog box.

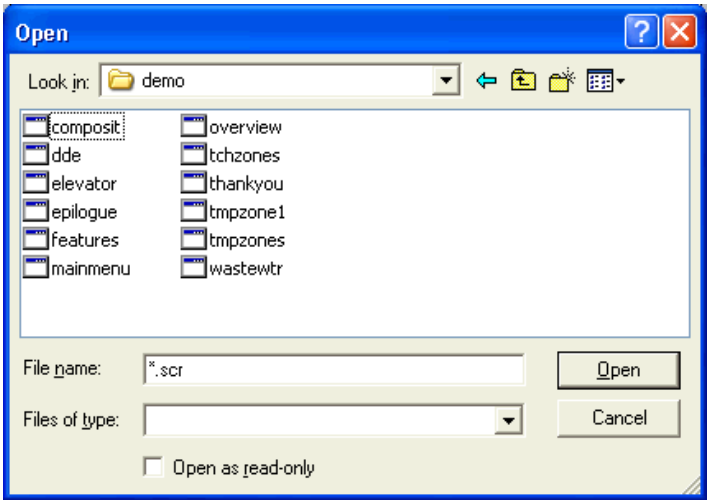


Figure 4-6: Screen Designer - File Open Dialog

To understand what each element in the Open dialog box stands for, you may click on the 'What Is This' (question mark) button on the right of the Open dialog box and then click on the element you want to learn about. Note that if you move the mouse selection cursor to an element and wait for a moment, a 'tool tip' will tell you what that element's name is. The following options allow you to specify which file (application screen) to open.

File Name: Type or select the file name you want to open. This box lists files with the extension you select in the Files of Type box.

Files of Type: Select the type of file you want to open; this must be *.SCR.
Look in (Folders): Select the project directory where Screen Designer should find/save the file that you want to open.

After you have chosen the file name, click on the OK button or click on the Cancel button to cancel the File Open request without opening a file. If the screen file you open was saved in a resolution different from your current screen resolution it will be transformed to appear the same (size) as before.

File → Save (Ctrl + S)
Use this command to save the current application screen to its current name and directory. When you save an application screen for the first time, Screen Designer displays the Save As dialog box so you can name your screen. If you want to change the name and directory of an existing screen before you save it, choose the Save As command.

File → Save As
Use this command to save and name the current application screen. Screen Designer displays the Save As dialog box so you can name your screen. This dialog box has elements similar to File Open. To save an application with its existing name and directory, use the Save command.

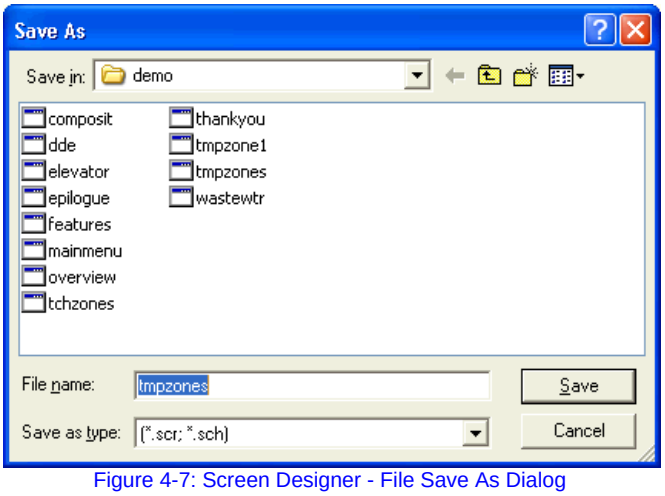


Figure 4-7: Screen Designer - File Save As Dialog

The following options allow you to specify the name and location of the file (application screen) you are about to save.

Save in (Folders):
Select the project directory (or the Folder) in which you want to store the application screen.

File Name
Type a new filename to save an application screen with a different name. A filename can contain many characters and an extension (file type) of up to three characters. Screen Designer adds the extension you specify in the Save File As Type box.

Click on the Save button when you are finished specifying the file name etc. You may click on the Cancel button to cancel the File Save request.

File Exit
Use this command to end your Screen Designer session. Screen Designer prompts you to save your current application screen if necessary.

4.3 Edit

The standard mouse cursor (arrow pointer) acts as a **Select** tool. Use this tool to select any specific object on screen by clicking the mouse on or near it. When an object is selected on the screen, eight small **sizer boxes** (Figure 4-8) appear around it. You may point inside the object you wish to select and drag it on the screen to position the object; or you may use the sizer boxes to resize the selected object just as you would resize any Windows window (that is, drag the desired sizer box to resize). To select a different object simply click near it; the previously selected object will be automatically deselected and the new object will be selected.

The Screen Designer also gives you the capability to modify common features of multiple selected objects. For example, if you selected a static text object and a text data object, you would be able to change the font and color of both objects at the same time. The **Select** tool lets you click and drag the mouse to select all objects in any rectangular region on the screen. To select multiple objects,

contained within another object, hold the shift key down and continue to select all the objects you want by dragging a box around them. Hit the ESC key to deselect all selected objects.

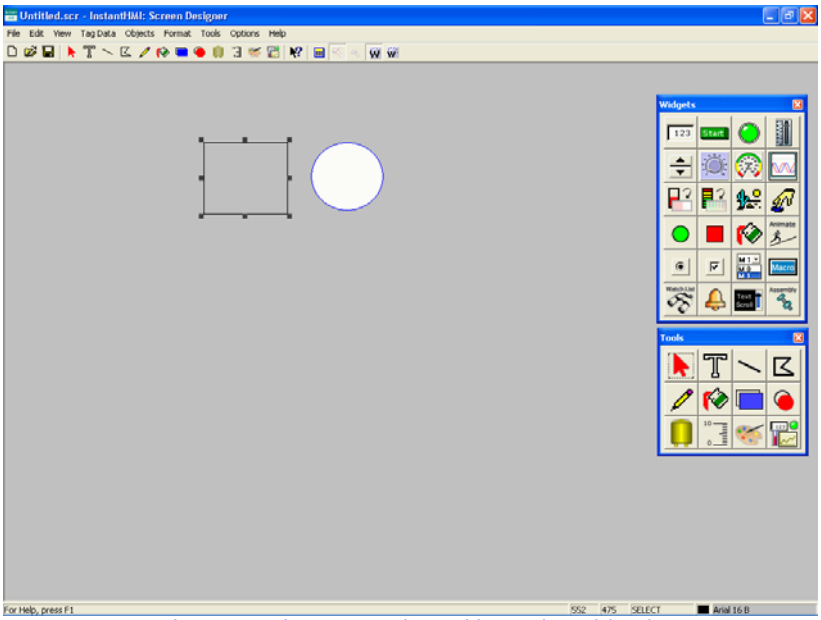

Untitled.scr - InstantHMI: Screen Designer
File Edit View Tag Data Objects Format Tools Options Help
Widgets
Tools
For Help, press F1

Figure 4-8: Sizer Boxes Show Object Selected (Box)

You may perform any Edit operations on the selected objects. Also, you may move any selected object by dragging it on the screen to the desired location. (Use the arrow keys to 'nudge' selected objects to position them precisely on the screen. The grid size may be set to 1 for the finest 'nudge' positioning.) If you click on a sizer box for a selected text object you will see the font dialog box which you can use to change the font size etc. To select a data object for editing double click on it when you are in the Select mode.

The Edit menu offers the following commands to operate on selected object(s):

Redraw	Clear screen to background color and redraw all objects.
Undo/Redo	Restores screen state after using other commands.
Move Object	Move the selection to a new location.
Copy Object	Copy all objects in the selection to new location.
Delete Object	Delete all objects in the selection.
Make Object Assembly	Combine selected objects into an object Assembly.
Break Object Assembly	Separate object assembly into individual objects.
Arrange Objects	Align selected Objects to match last selection.

4.3.1 Redraw

The **Redraw** command clears your application screen to the screen background color, then redraws all objects in your application screen. This command is useful to check out your actual application screen, when you find "crumbs" left over after certain Edit operations.

4.3.2 Undo (Ctrl + z) and Redo (Ctrl + y)

Use the Undo and Redo commands (repeatedly upto 25 times) to restore objects edited by using other commands including Add/Delete/Move/Resize objects and Change Properties. Exceptions include: Make/Break Object Assembly, Multiple Object moves (in 1 sec), OLE and Activex objects.

4.3.3 Move Object

To move a group of objects, use the Select tool to establish the selection. After the objects are selected execute this command from the Edit menu, hold down the left mouse button and drag the outline of the bounding rectangle to the desired new location. Release the mouse button to finish. Hit the ESC key to deselect all selected objects.

4.3.4 Copy Object

To copy a group of objects, use the Select tool to establish the selection. After the objects are selected execute this command from the Edit menu, hold down the left mouse button and drag the outline of the bounding rectangle to the desired location. Release the mouse button to finish. Hit the ESC key to deselect all selected objects.

4.3.5 Delete Object

To delete a group of objects, use the Select tool to establish the selection. After the objects are selected execute this command from the Edit menu; all selected objects will be deleted. You may also press the Del key to delete the objects. Use the Undelete Object command to restore your deletion.

4.3.6 Make Object Assembly

The Screen Designer allows for the creation of **Object Assemblies**. Object Assemblies may include active data objects as well as static objects, images and touch zones. Also image objects are allowed to be part of object assemblies and they resize if the object assembly is resized. An object assembly will behave as a single object which can be selected, re-sized, deleted etc. Use the Edit menu option 'Make Object Assembly' to "glue" together the selected objects on screen and make them into a single object assembly. You may convert a single object as well into an Object Assembly, since Object Assemblies have additional properties beyond the included object(s). These properties, enable '**dynamic runtime association**' of object assemblies based on multiple data sources, multiple stations, and multiple tag groups, each of which may be selected at runtime by User or by Tag Value of associated tags.
Note: Rotation of object assemblies containing non-rotatable objects is not allowed.

Example: How to Build Object Assembly 'Tank A'
Here we will show you how to build the 'Tank A' object assembly using native objects included in the InstantHMI Designer. Figure 4-9 shows the component objects used in building the 'Tank A' object assembly which are listed below:

1. Tank Structure
2. Tank Level Indicator
3. Tank supply pipe, label etc.

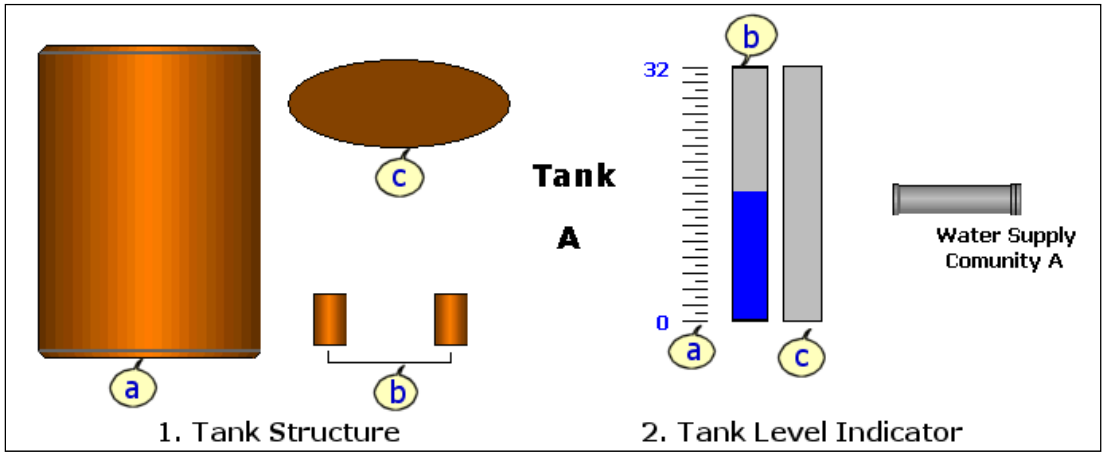


Figure 4-9: Tank A Object Assembly Components

1. Tank Structure

To build the Tank Structure we assemble together the following objects:

(a) Tank body
(b) Tank legs
(c) Tank top

In the Screen Designer click on Objects → Static Objects → Tank. You will see the 'Tank' dialog (Figure 4-10), where you make the entries as shown. Note that we selected a vertical orientation, Flat End Tank, and Tank Color as shown. Click OK and position the Tank Body on the screen as desired.

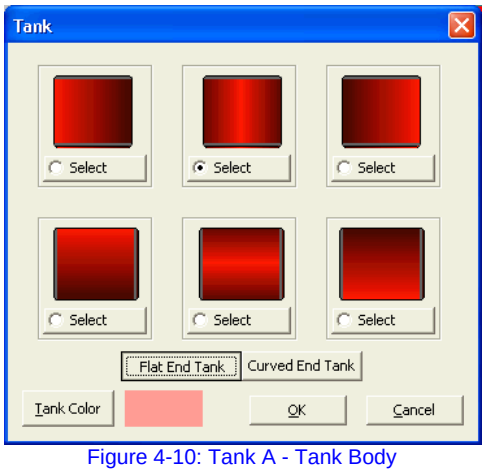


Figure 4-10: Tank A - Tank Body

Use the same Tank dialog to build the two Tank Legs. You may accept the Tank Top as is. We have chosen to re-shape the Tank Top by placing an Ellipse of the right size and color from the Tool palette. We could also have chosen to use a Curved End tank instead of Flat End. You have several flexible choices in building a Tank Structure.

2. Tank Level Indicator

To build the Tank Level Indicator we assemble together the following objects:

(a) Scale
(b) VBar widget
(c) VBar bounding rectangle

In the Screen Designer click on Objects → Static Objects → Scale. You will see the 'Scale' dialog (Figure 4-11), where you make the entries as shown.

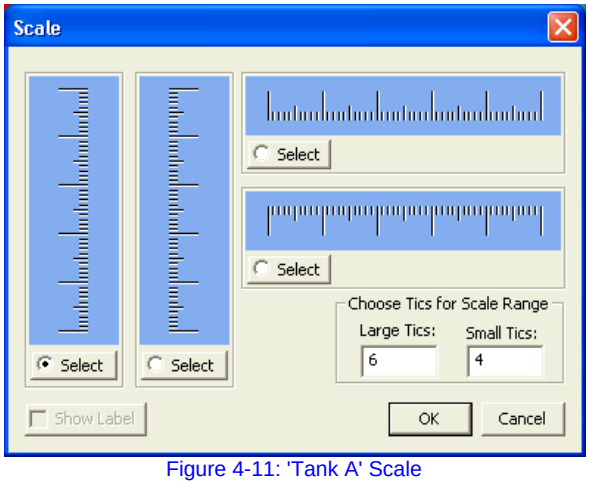


Figure 4-11: 'Tank A' Scale

Position the Scale on the Tank as desired. Now 'Pick and Place' a VBar widget, position it next to the Scale on the Tank Body, double click on the VBar widget and attach the Tag ' Water Level -Tank A'. (If you so wish, you may place a bounding rectangle (for special effect) before placing the VBar widget. You may also use the Tank dialog to add the outlet pipe. Finally, enter any Label Text desired).

Now you have finished assembling 'Tank A' object assembly. Use the 'Select' tool on the Tool Palette and drag a rectangle encompassing all the objects in the Tank A you just assembled and right click to pop-up the 'Block Menu'. Click on 'Make Object Assembly' to display the following dialog:

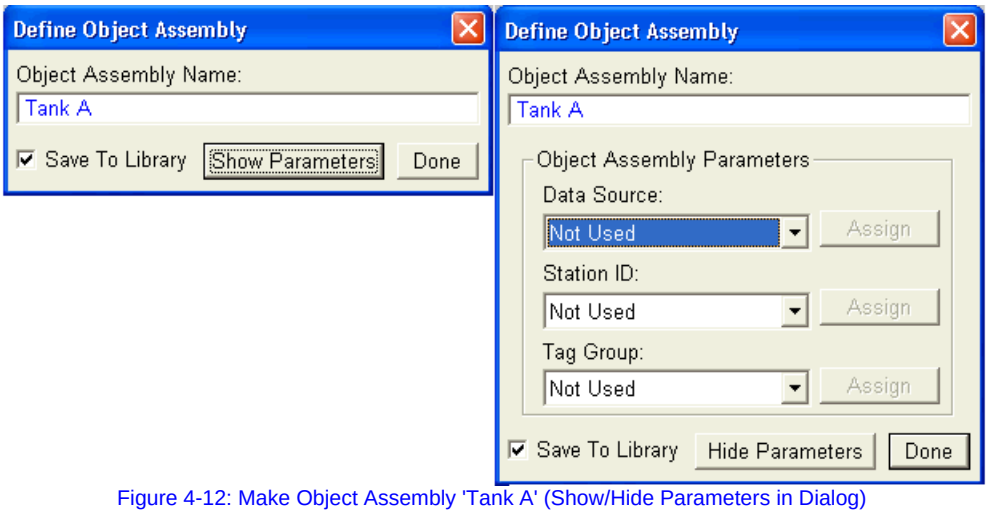


Figure 4-12: Make Object Assembly 'Tank A' (Show/Hide Parameters in Dialog)

Enter the name 'Tank A' (ignore the other Object Assembly Parameters, which are explained later on) and click OK. You have successfully created the Object Assembly 'Tank A' and stored it in the Object Assembly library. Note: The default name for the library is ObjectAssembly.LIB. You may change the object assembly library name using Options, Customization, Misc (Section 4.9.2).

Besides the label 'Tank A' the only item unique to Tank A is the tag value 'Tank Level A'. You may use the 'User Specified' Tag Group property to switch from tag 'Tank Level A' to tag 'Tank Level B'; use a second name tag which takes two values 'Tank A' and 'Tank B'. We will illustrate this using a 'Tank Status' object assembly to represent Tank A and Tank B at runtime.

Use Object Assembly Parameters to Re-Assign Object Assembly 'Tank Status' at Runtime

Tag Name	Data Type	Data Format	Memory Type	Memory Address	Tag Group Membership	See Figure 4-13
Water Level - Tank A	Monitor	Integer	Local	101	Tank A	Item 1
Alarm State-Tank A	Monitor	Integer	Local	102	Tank A	Item 2
Alarm Message-Tank A	Monitor	Message	Local	102	Tank A	Item 3
Label Text -Tank A	Monitor	Message	Local	???	Tank A	Item 4
Water Level - Tank B	Monitor	Integer	Local	151	Tank B	
Alarm State-Tank B	Monitor	Integer	Local	152	Tank B	
Alarm Message-Tank B	Monitor	Message	Local	152	Tank B	

We have included here an excerpt from a 'Water Supply System' example described in detail in Quick Start Guide. Six tags from the tag database are shown as well as the Object Assembly 'Tank Status'. Note that the Tag Group (Tank A or Tank B) will be selected by user at Runtime so the single 'Tank Status' object assembly may display Tank A Status or Tank B Status. The same assembly could be used for many tanks defined in a similar manner. The Tag Group (ID) may also be selected by the Tag Value of a special tag assigned to the Object Assembly. This allows the use of a 'Pull-Down List', a Spinner, or even a PLC register at runtime to switch the Object Assembly from one tag group to another.

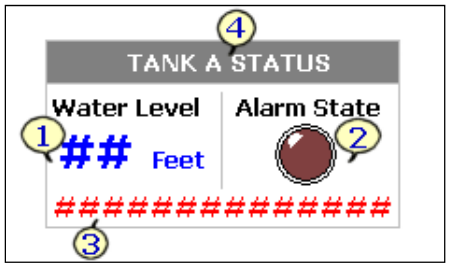


Figure 4-13: Object Assembly ' Tank Status'

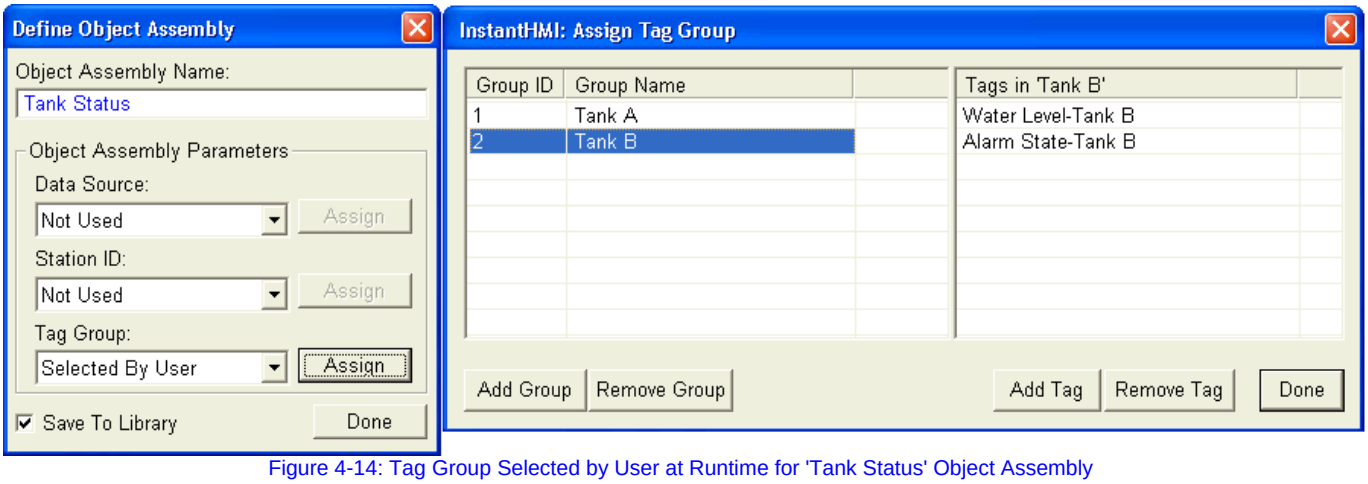


Figure 4-14: Tag Group Selected by User at Runtime for 'Tank Status' Object Assembly

4.3.7 Break Object Assembly

This Edit menu option is enabled when you have selected an object assembly on the screen. Select the object assembly you want to break up into individual objects and then click on the Edit → Break Object Assembly command. After the break up, individual objects in the former object assembly can be selected, moved, deleted etc. All object assembly properties defined for this assembly will be discarded.

4.3.8 Arrange Objects

The Arrange menu offers the following commands to facilitate screen design:

Align Left/Centers/Right	Align selected Objects to match last selection.
Align Top/Middles/Bottom	Align selected Objects to match last selection.
Center in Screen	Center selected Objects on Screen (vertically/horizontally).
Make Same Width/Height/Size	Resize selected Objects to match last selection.
Space Evenly Across/Down	Move Selected Object to evenly space across/down the screen.
Move to Front/Back	Move Selected Object to front/back.

These menu items are also available on the Style Bar (Section 4.1.4). Ten of the commands are used for alignment of selected objects on screen and they work in the same manner. For example, if you select three Box objects on screen and then click on **Align Left**, then the first two boxes will be moved on screen so that their left side aligns with the left side of the third box.

When two objects are overlapping then you may select one of them and click on the Move to Front or Move to Back command to achieve the desired effect. Any object that is hidden by other objects in front of it may be moved to the front of the screen. Just select the hidden object and then click on the **Move to Front** command. You may also select the object in front and then click on the **Move to Back** command to reveal the objects hidden behind it. These tools are also helpful when you decide to draw an object underneath another object already on screen.

4.4 View

The View menu offers the following commands to customize the view of the Screen Designer design windows to suit your preferences:

Grid	Set grid spacing and Hide/show Grid lines
Tool Bar	Hide or show Tool Bar
Style Bar	Hide or show Style Bar
Status Bar	Hide or show Status Bar
Tool Palette	Hide or show Tool Palette
Widget Palette	Hide or show Widget Palette
Clipboard Palette	Hide or show Clipboard Palette
Keypad	Hide or show Keypad (reserved)

The **Grid** command pops up a dialog box to specify the horizontal (x) and vertical (y) grid dimensions. When objects are sized or moved, they are aligned to the nearest grid location that is not greater than the current mouse pointer location. This option can be used to help you align text and other objects visually on screen. You may turn on or turn off the on screen grid display to help you during screen design using the Toggle Grid display on/off tool on the Style Bar (Section 4.1.4).

The Tool Palette, and Widget Palette may be re-sized as well as dragged and placed anywhere in the Screen Designer window to create a view to suit your convenience. The Key Pad feature is reserved for later implementation.

4.5 Tag Data

The Tag Data menu offers the following commands, which are discussed in detail in other Sections as indicated:

Data Viewer	See Section 3.2
Tag Manager	See Section 3.4
Data Sources	See Section 3.1
Message Groups	See Section 3.4
Image Groups	See Section 3.5
IP Manager	See Section 3.1

4.6 Objects

The Objects menu offers the following commands to create objects on your application screen:

Static Objects	Create a static object (Text, Line, Box, etc.).
Data Object	Create data object.
Watch List	Create data object.
Object Assembly	Recall object assembly from library.
Touch Zone	Create touch zone object.
Text Scroll	Create a Text Scroll box and specify a file to get text contents from.
Alarm Log Viewer	Create alarm log viewer object.
Real Time/Historic Trend	Create Trend object for viewing Real Time/Historic trends.
OLE Object	Create OLE object.
ActiveX Object	Create ActiveX container and identify the ActiveX server file.
Spreadsheet Viewer	Create Spreadsheet object to view .CSV and other text files.

4.6.1 Static Objects

We use the terms Tool and Object interchangeably to denote items in the Static Objects menu. This is because the Text tool is used to create the Text object, Box tool is used to create Box object etc. Note that the Status Bar always shows the tool (object) selected. Any selected tool remains in effect until another tool is selected. (See Section 4.9.2, Customization, to set the defaults for your screen design).

Static Objects differ from (Active) Data Objects in that they have no tag associated with them; they are displayed on screen as they are designed at runtime. However, most objects (Static as well as Data) may be assigned **Attribute Tags**, which control the 'Visibility' of the object on screen. The attribute tag enables designing 'pop-up' windows (mini-screens) as part of the screens you design (see Section 4.12).

Note: You may view the static object properties dialog by double clicking on the object, or by right clicking and selecting 'Component Object Properties' from the pop-up menu.

The Tool Palette includes the available object tools, which are described in the table below.

	Text	Enter text after selecting desired Font, size, color etc. The Status Line shows current font and color.
	Line	Create line objects.
	Poly Line	Create connected multiple line objects.
	Draw	Create freehand drawn graphic objects.
	Fill	Create graphic fill objects.
	Box	Create box (rectangle) objects. The box may be empty or filled.
	Circle	Create circle objects. The circle may be empty or filled.
	Tank	Create Tank objects.
	Scale	Create Scale objects.
	Image	Load image objects (.bmp/.jpg/.gif imported from other applications).

Text Object

Use Text tool (accessed from the Screen Designer menu **Objects → Static Objects → Text**) to create static text objects on screen; that is, to enter text on the screen. The Status Bar shows the current Text font and color. Use the Font menu and the Color menu to change the font and color for the text. Right-click on Text Object to display the 'Component Object Properties' dialog to enter (multiple lines of) text, change Orientation, Alignment, Color and Font Properties.

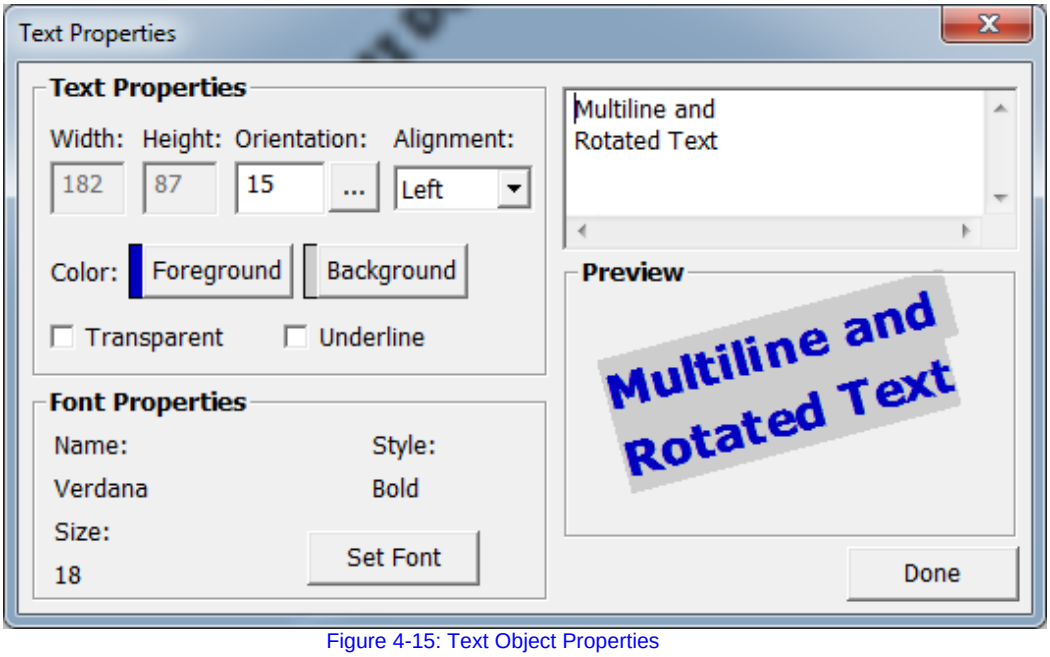


Figure 4-15: Text Object Properties

See also Section 4.7.1, Text Display Mode and customization option (Section 4.9.2) to set the default Color, Font, etc. for Text objects.

Line / Poly Line Object

Use the Line tool (accessed from the Screen Designer menu **Objects → Static Objects → Line**) to draw a line on screen, that is, create a static line object. (The current pen width and pen color are used to draw the line. Note that the Status Bar shows the pen color for the line and the Style bar shows the Line Style and Line Color.) To draw a line, position the mouse on one end of the proposed line and drag the mouse (hold the left button down while moving the mouse). You will see a rubber band line indicating what your line would look like. When you are happy with the line on screen release the mouse button. Double click on the line to view the Line Object Properties dialog, where you can view and edit its properties: Style, Color, Width, Length and Orientation (Rotation Angle about its center). You may also change the line style after it is drawn, by selecting it and using the Line Style pull down list on the Style bar or the Format → Pattern menu.

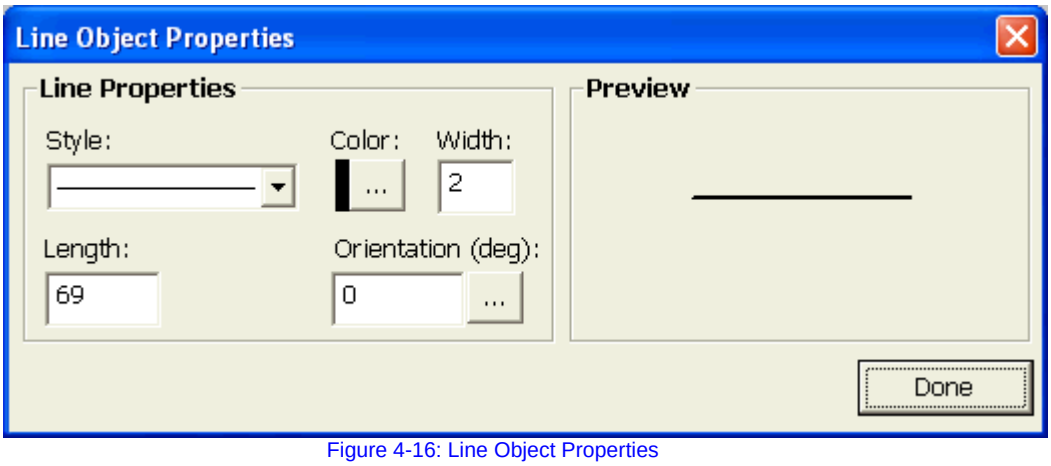


Figure 4-16: Line Object Properties

Use the Poly Line tool (accessed from the Screen Designer menu **Objects → Static Objects → Poly Line**) to draw multiple connected lines on the screen. To draw a straight line, click on the screen at the start of the line, release the mouse button and move the mouse to the end of the line. A "rubber band line" will appear on screen. When you see the desired line click the mouse. If you drag the mouse (click and hold the left button while moving the mouse) then you will be drawing continuously on the screen. To finish drawing the Poly Line, release the mouse button and press the Esc key.

Draw Object

Use this tool (accessed from the Screen Designer menu **Objects → Static Objects → Draw**) to create static freehand drawn objects. The drawing pen width and pen color are controlled by a pop up dialog box shown to you when the draw object is created. Change the pen and color as desired and press the Enter key to start drawing by dragging the mouse on the screen. Use the Escape key to open the dialog box to change pen size and color for further drawing. All free hand drawing done with a single selection of the Draw object will be treated as a single object for future reference. The draw dialog box may also be opened (by pressing the escape key) to change pen color or pen width when editing the draw object. When finished with drawing tool press Escape key and click on Done in the draw dialog box.

Fill Object

Use this tool (accessed from the Screen Designer menu **Objects → Static Objects → Fill**) to create static graphical fill objects to fill any open area of screen bounded by a well defined continuous single color boundary. When you choose the fill tool, the tool name 'Fill' and the current fill color will appear on the Status bar. To change the fill color use the Format → Color → Fill menu option (Section 4.7.2) and to change the boundary color use the Format → Color → Pen option (Section 4.7.1). Now click inside an area you propose to fill. If all goes well the intended area will be filled

and a little "fill identifier" box would appear at the point where you started the creation of the fill object. This box will be used by select tool to identify the Fill object.

Note: Since fill can lead to an occasional runaway situation, it is suggested that you save the current screen before creating fill objects. It is always a good idea to save your screen periodically to serve as a backup starting point in case an unexpected catastrophe strikes.

Box Object

Use this tool (accessed from the Screen Designer menu **Objects → Static Objects → Box**) to create a static box object (rectangle), that is, to draw a box on screen. Note that the Status Bar shows the pen color for the box. To draw a box, position the mouse on the top left corner of the proposed box and drag the mouse (hold the left button down while moving the mouse). You will see a rubber band rectangle indicating what your box would look like. When you are satisfied with the size of box on screen release the mouse button. Right click to display the Object Menu as shown.

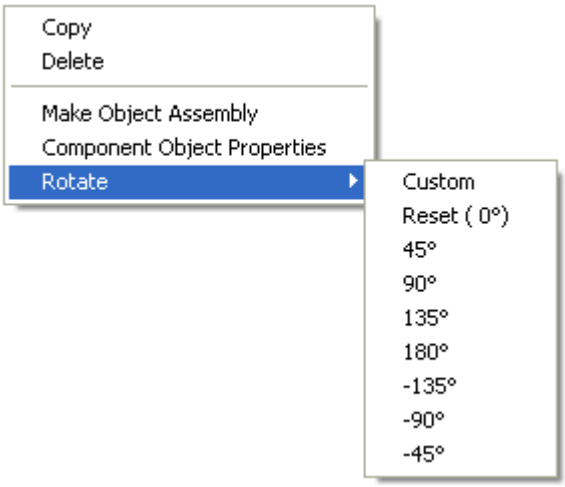


Figure 4-17: (Right Click) Object Menu

The edit functions (Copy, Delete and Make Object Assembly) were described earlier in Section 4.3. The Rotate menu allows you to rotate the object (anti-clockwise by specified number of degrees) to get the desired orientation. Click on the 'Component Object Properties' menu to display the Box Object Properties dialog.

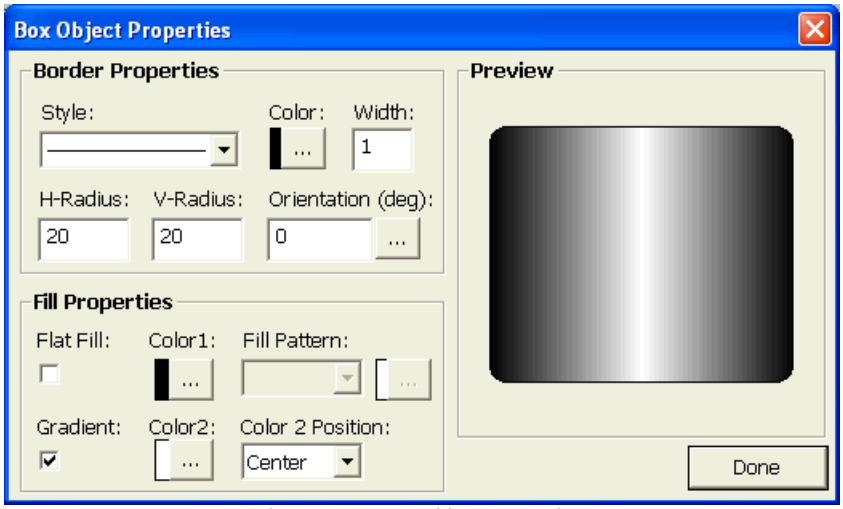


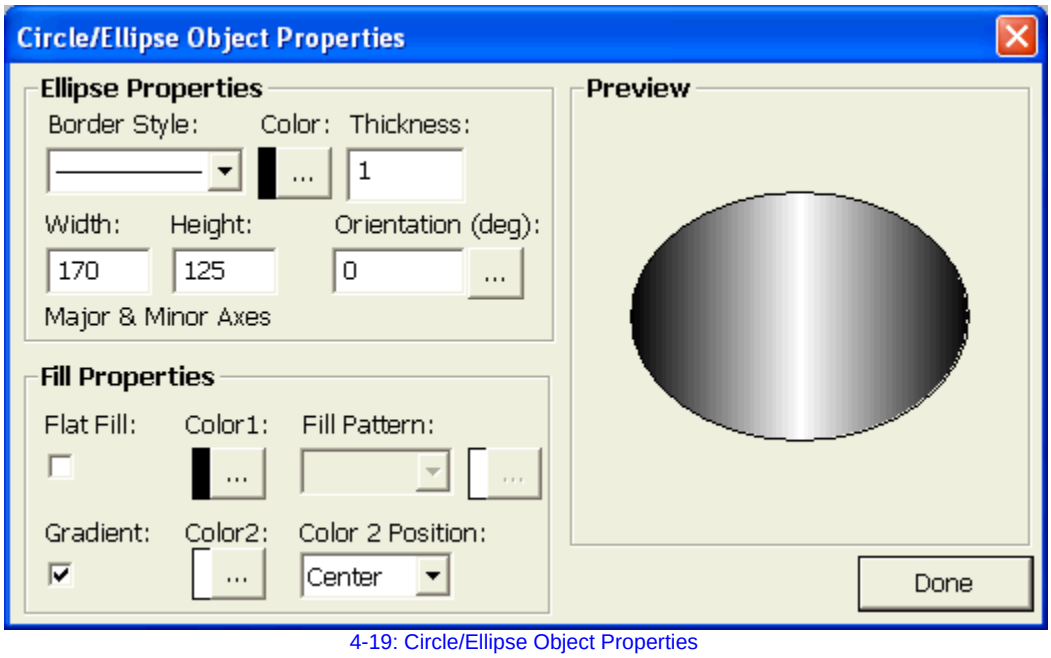
Figure 4-18: Box Object Properties

The rectangular border outline of the box will be drawn with line Style, Color and Width selected. You may also choose a rounded corner with horizontal (H-Radius) and vertical (V-Radius). The box Orientation angle may also be specified to rotate the box as desired. You may also choose to fill the interior of the box. Select Flat Fill to fill the interior with Color 1. If you desire a Gradient Fill also

select Color 2 and its position for the gradient effect. You may change the border (outline color or thickness) of any box you drew by selecting it and then changing the Pen Color or Pattern. The changes apply only to the selected box object; all future box objects will have the Pen Color shown on the Status Bar.

Circle/Ellipse Object

Use this tool (accessed from the Screen Designer menu **Objects → Static Objects → Circle**) to draw a circle, that is create static circle objects. The current pen width and pen color are used to draw the circular outline of these objects. Note that the status line shows the pen color for the circle. To draw a circle, position the mouse at the center of the proposed circle and drag the mouse (hold the left button down while moving the mouse). You will see a rubber band circle indicating what your circle would look like. When you are happy with the circle on screen release the mouse button. Right click to display the Object Menu (see Figure 4-17) . Click on the 'Component Object Properties' menu to display the Circle/Ellipse Object Properties dialog. (For a Circle set Width=Height.)



4-19: Circle/Ellipse Object Properties

The border outline of the circle will be drawn with line Style, Color and Width selected. The Orientation angle may also be specified to rotate the circle/ellipse axes as desired. You may also choose to fill the interior of the circle/ellipse. Select Flat Fill to fill the interior with Color 1. If you desire a Gradient Fill also select Color 2 and its position for the gradient effect. You may change the border (outline color or thickness) of any circle/ellipse you drew by selecting it and then changing the Pen Color or Pattern. The changes apply only to the selected circle/ellipse object; all future box objects will have the Pen Color shown on the Status Bar.

Tank Object

Use this tool (accessed from the Screen Designer menu **Objects → Static Objects → Tank**) to create and include Tank objects on your screen. You have a choice of Tank Colors tank Styles (Flat End or Curved End) in any one of the six selections shown in the Table and as illustrated in the Tank Dialog.

Note: Starting with version 5.1.4 Build 3005, **Tank** drawing code has been enhanced to use a **GradientFill()** function to improve the display performance of the object and give it a smoother color transition.

Orientation	Vertical	Horizontal
Light Source/ 3-D shading effect	Left	Top
	Front	Center
	Right	Bottom

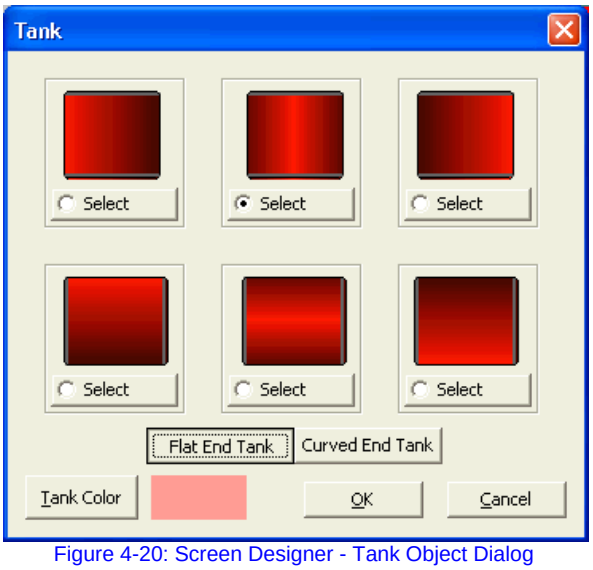


Figure 4-20: Screen Designer - Tank Object Dialog

Click on the Tank Color button and select the color (from a standard color dialog (Section 4.7.2). Choose a Flat End Tank or Curved End Tank and then click on one of the six available selections and then click OK. This places a resizable Tank on the top left corner of your screen. Re-size and drag the tank to position it at the desired location on the screen.

Scale Object

Use this tool (accessed from the Screen Designer menu **Objects → Static Objects → Scale**) to create and include Scale objects on your screen. You have a choice of scale hash mark (number of Large/Small tics) in any one of the four selections shown in the Table and as illustrated in the Scale Dialog.

Orientation	Vertical	Horizontal
Hash marks alignment	Right aligned	Bottom aligned
	Left aligned	Top aligned

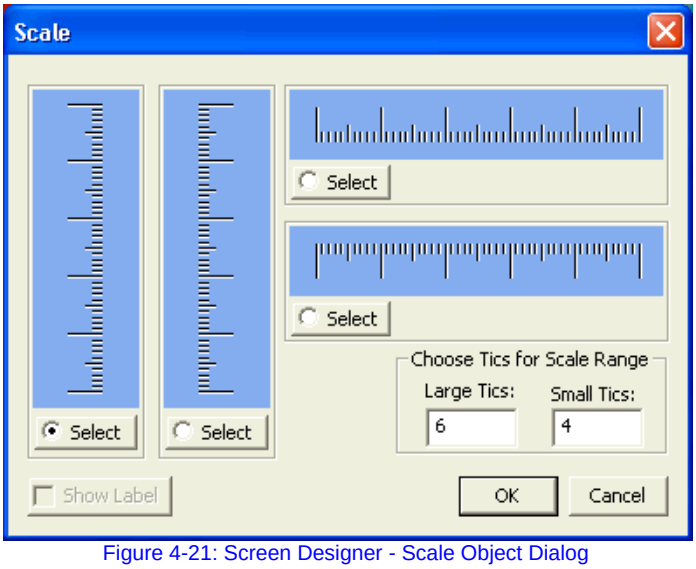


Figure 4-21: Screen Designer - Scale Object Dialog

The scale previews shown correspond to the number Large and Small Tics shown. To change the Tics click on the Large/Small Tics edit field and type the number of tics desired and the Tab key. Observe the scales in the preview change. Click on one of the four available scale selections and then click OK. This places a resizable Scale on the top left corner of your screen. Re-size and drag the Scale to position it at the desired location on the screen. An example of the use of Scales and Tanks is shown below:

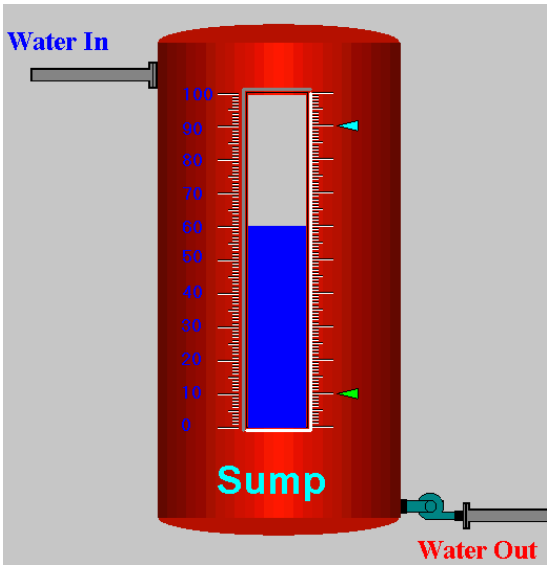


Figure 4-22: Screen Designer - Object Using Scales and Tank

Image Object

Use this tool (accessed from the Screen Designer menu **Objects → Static Objects → Image**) to create image objects that include .bmp or .jpg or .gif images created and saved in some other application. This tool will be useful to include your company logo, scanned images of the part of your machine or process on display screen, CAD images etc. To include a bitmap on your screen, select this tool and position the mouse cursor where you want the top left corner of the bitmap. (To re-size the image drag a rectangle of the desired size to place the image). You will see a 'Select Image' browser dialog. Select desired image and click OK. You will see the 'Image Properties' dialog. You may resize the image; maintain its aspect ratio to avoid distortion. Check the transparent color box and click on the color button; you may now move the cursor on the image to choose one of the colors on the image as the 'transparent color' or enter the RGB numbers for the desired transparent color. Note: a 'transparent color' allows the background beneath the transparent color pixels to show through.

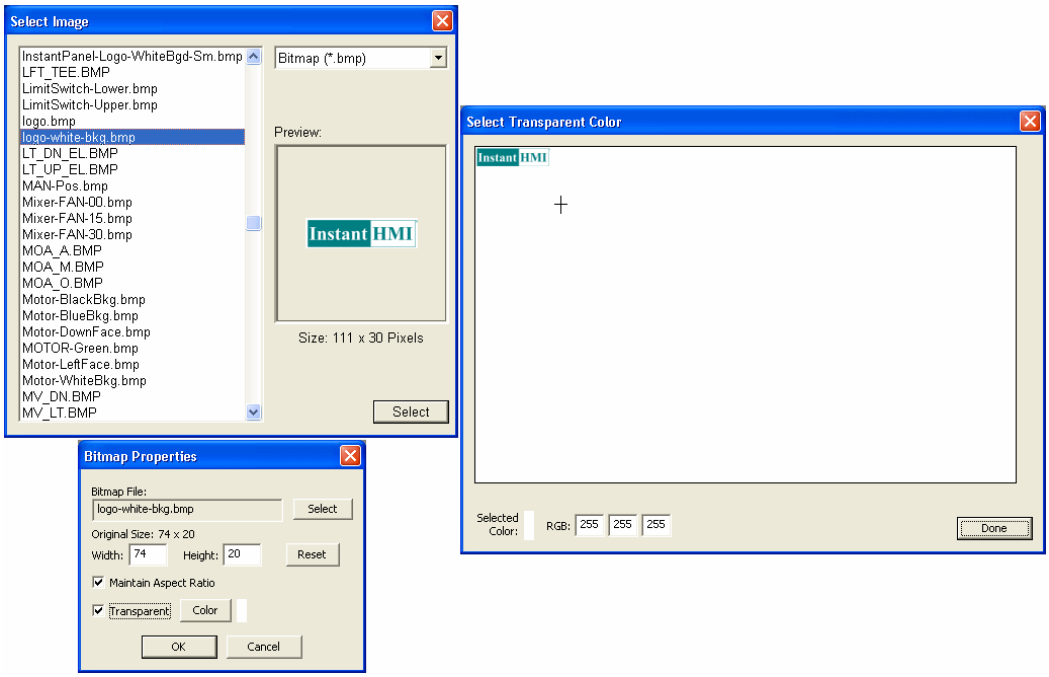


Figure 4-23: Screen Designer - Select Bitmap and its Properties

Screen Designer will display your bitmap on screen. To reposition the bitmap object click to select it and drag to the desired location. To resize the bitmap, select it and then resize as desired. To restore the bitmap to its original size click Reset. Note that Screen Designer also allows an animated Bitmap data object (Section 4.11.2).

4.6.2 Data Object (Active Object)

(The names Data Object, Active Object, Data Display Object and Active Display Object are interchangeable.) This section gives a brief sketch of the Data Object. A more detailed discussion is included in the later Section 4.11. Use this tool (accessed from the Screen Designer menu **Objects → Data Object**) to create data objects on screen. Note that OI-Widgets data objects can be accessed from a convenient Widgets Palette (Sections 4.11.3, 4.11.5). Data objects display information to the operator for monitoring and control when the InstantHMI Runtime Engine application is running. Locate the data object on screen by moving the mouse cursor and then click the left button. When the data object is thus created, a pop up dialog box is presented to help you enter the data 'Display Object Properties': Data Type, Display Format, Field Width, Font, Color, etc. Also shown is the associated Tag Information: Tag Name, Data Source, Sample Time etc.

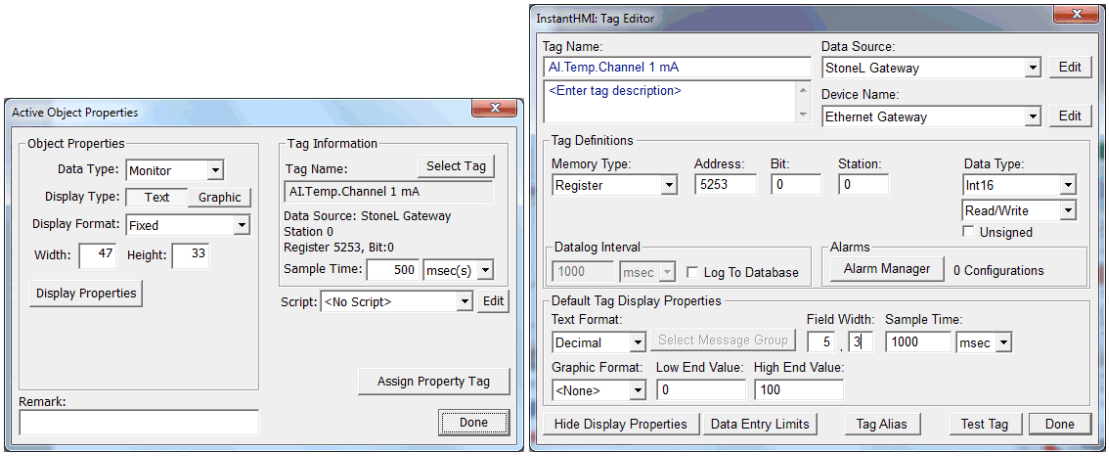


Figure 4-24: Display Object Properties (Left: Screen Designer - Right: Tag Editor)

Note: The Screen Designer can access the Display Object Properties stored with objects on user designed screens; these properties supersede the default display properties stored with the tag definition. Tag Display

Properties stored with the tag definition as shown in the Tag Editor (Section 3.3.3) dialog are used for pre-formatted screen display objects in InstantHMI (usually on non-PC platforms). You may access the display object properties by right clicking on it and then selecting **'Component Object Properties'** from the right click menu.

Select the Data Type Input, Monitor, Input/Monitor from the pull-down list. Select the Display Format Text (and one of the options Integer, Long, etc.) or Graphic (and one of the options LED, Gauge, etc.). Select the Tag Name to be associated with this data display object. The detailed tag definition under this Tag Name is made using the Tag Manager (Section 3.3.1). If you change your mind about creating the new data item you may click on the Cancel button. If you choose to accept your data display object properties by clicking on the OK button you will return to the design window. Here your data display object will be indicated by a suitable symbol such as ####, a raised box, etc.

You may click on any widget on the Widgets Palette (Sections 4.11.3, 4.11.5) and then click on the screen to place the selected widget on screen. To customize the widget double-click on it and change the data display object properties to suit your requirements. Some widgets may be shown on screen using a static bitmap representing the widget (which will be animated at runtime by the runtime engine).

4.6.3 Watch List

The **Watch List** object allows you to monitor/modify tags from your Tag Groups at Runtime. Click on Objects → Watch List to place a watch list on the top-left corner of your screen. Click on it to select it, and drag it to reposition it on screen, and resize it like any other object on screen. The Watch List object displays tag values from any watch list tag group selected (at runtime) from its pull-down list of tag groups. To define the watch list tag groups double click on the watch list title bar to access its Parameters dialog. (Note that double-clicking on a row in the body of the list selects it at runtime for data entry.) Here you may create Watch List groups, which may be groups from the tag database or specially created watch list groups, where you may include tags of interest from the tag database by clicking the Add Tag button.

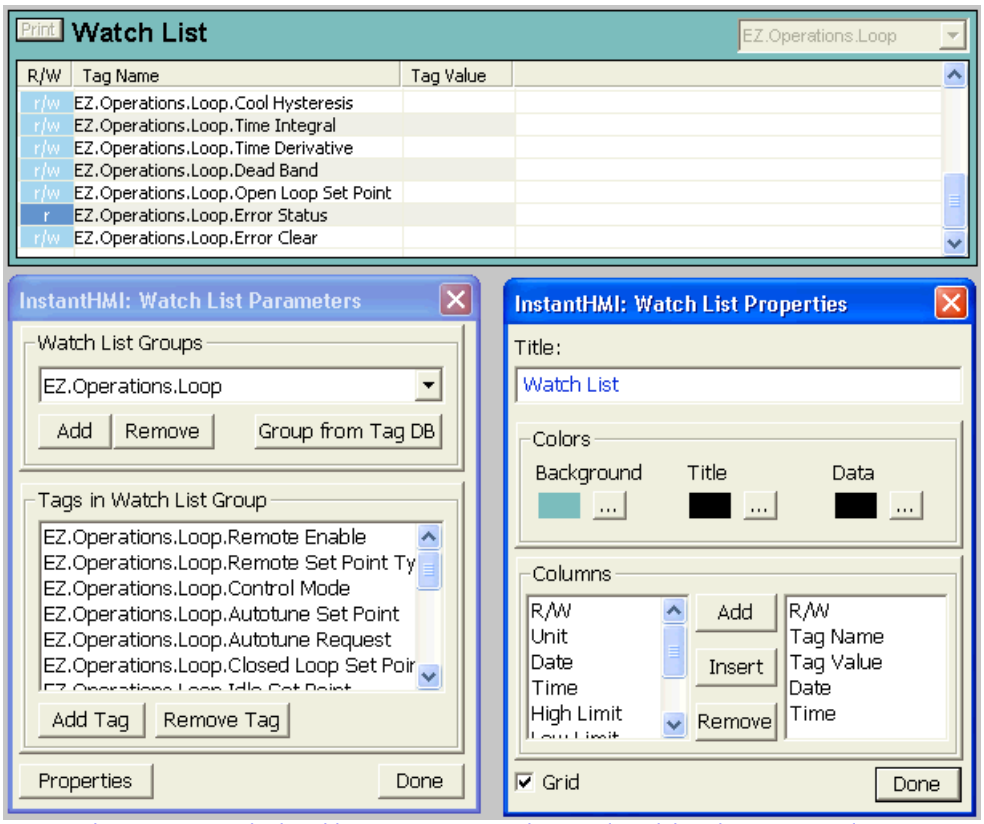


Figure 4-25: Watch List Object, Parameters and Properties Dialogs in Screen Designer

In the Parameters dialog, click on Properties button to access the Properties dialog, which allows you to setup the tabular tag display columns (properties) useful at runtime. The default columns that must be included are Tag Name and Tag Value. Other available Columns are:

- R/W (Read/Write or Read only tag)
- Date
- Time
- High Limit
- Low Limit
- Etc.

The order of the included columns is shown on the right. Click on additional column name of interest on the left and then the Add button. Use the Insert button to add the column before a selected column (already included for the tabular display). These are the columns of data included in the Watch List at runtime. You may enter title text for the watch list as well as set the colors for the watch list (Background, Title and Data). At runtime the same watch list can be used to 'watch' tags from any of the watch groups. In addition, if the Tag allows data input (that is, it has r/w property), you may enter data through the watch list by double clicking on that tag name.

Using Watch List in an Object Assembly

You may convert the Watch List object into a (single-object) object assembly to create a compact and yet powerful monitoring and data entry screen. In this case, the object assembly tag groups, which will supersede the watch list groups (pull-down list), may be selected based on tag values etc. as discussed earlier (Section 4.3.6). An example screen using such a concept is shown in Figure 4-26; here a single watch list is capable of providing monitoring and data entry access to over 1600 tags associated with three different controller types (EZ-Zone ST, Series-SD and Series-96) connected on a Modbus network, the tags for each controller station being organized neatly into Pages (Operations, Setup, Factory, etc.) with menus (that is tag groups Alarm, Analog Input, Operations, etc.) changing based on operator selected page. The Pages and Menus are implemented as Touch Zones with associated macros enabling the object assembly tag group selection.

Figure 4-26: Watch List Object Assembly in Runtime

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4.6.4 Object Assembly

In the context of Object Assemblies there are several topics of interest as tabulated below.

Topic	See
Making Object Assembly	Section 4.3.6
Breaking Object Assembly	Section 4.3.7
Object Assembly Library	Below
Object Assembly Properties (Runtime Assignment)	Below
Object Assembly Copies (tag Group Assignment in Designer)	Below
Example: Watch List in an Object Assembly	Section 4.6.3

Rotation of object assemblies containing non-rotatable objects is disallowed.

Object Assembly Library

Use the Object Assembly tool (accessed from the Screen Designer menu **Objects → Object Assembly**) to recall an object assembly from the object assembly library. When you choose this option you will see a dialog box listing the objects from the selected library. In version 5.1, the Object Assembly Library has been enhanced to support several new functions:

- Assembly Groups, to organize object assemblies in named groups
- Import assemblies from another project assembly library
- Each Assembly has dynamic properties useful at runtime (Section 4.3.6)

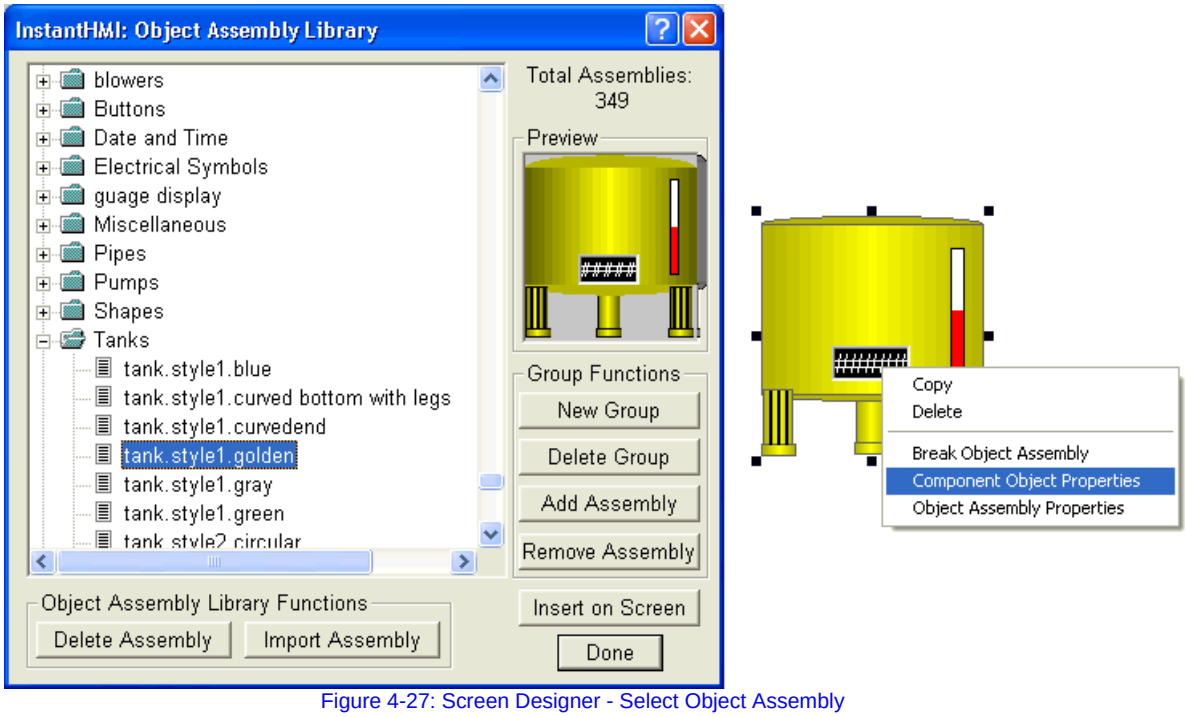


Figure 4-27: Screen Designer - Select Object Assembly

You may select the default 'All Object Assemblies' group, scroll through the object names as you view them in the pre-view window to help you select the desired object. Use New Group button to create a new group, use Add Assembly button to add selected object assemblies to the group, etc., to organize your object assembly library. After selecting an object assembly (example: tank1.curvedBT-golden), click on 'Insert on Screen' button to retrieve the object assembly you selected from the library and place it on the top-left corner of your screen. Click on it to select it, and drag and resize it like any other object on screen. You may double-click on an object assembly to access its properties. To edit any component object in an object assembly (example: vertical bar in the tank assembly) right click on the object assembly and then select 'Component Object Properties'.

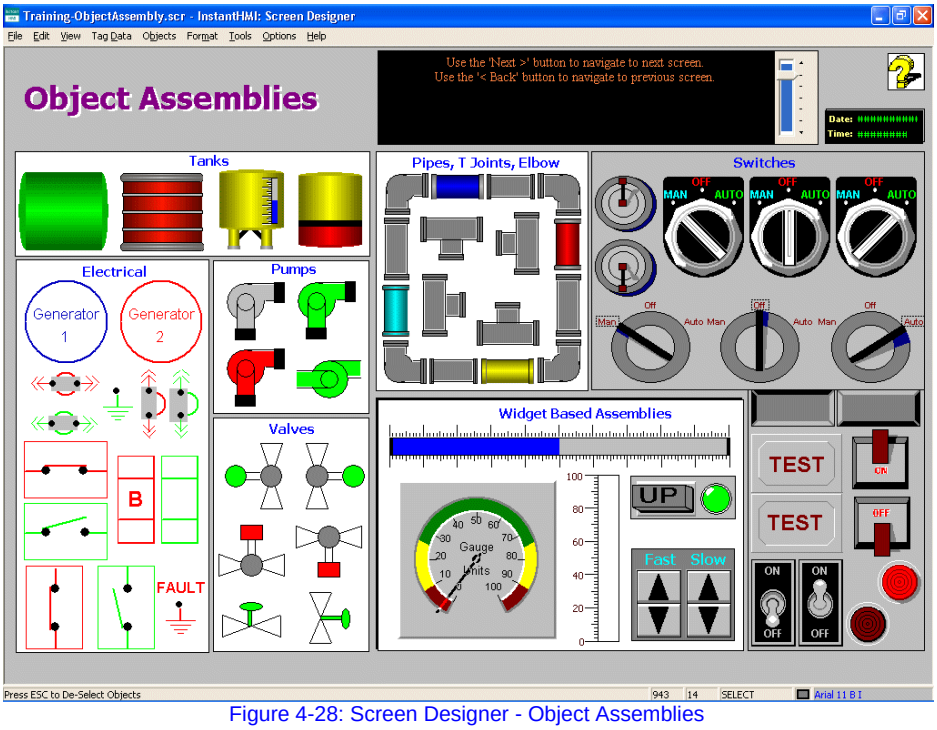


Figure 4-28: Screen Designer - Object Assemblies

To select a different library, use the **Options → Customization → Object Assemblies** tab. Here you may also assign object assemblies to custom user widgets on the widget palette. To delete object assemblies from the library click on the Delete button when you are viewing the object assemblies from the library.

Object Assembly Properties used for 'Dynamic Runtime Association'

Object Assemblies have additional properties beyond the included object(s) as tabulated below. These properties, enable '**dynamic runtime association**' of object assemblies based on multiple data sources, multiple stations, and multiple tag groups, each of which may be selected at runtime by User or by Tag Value of associated tags (Section 4.6.3). To take advantage of these properties, you may convert a single object into an Object Assembly.

Note: If you right click on a data object within the object assembly, you may access 'Component Object Properties' from the right click menu.

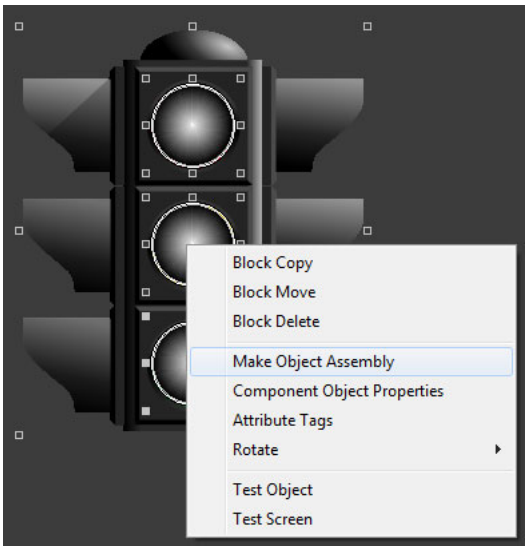
Assign How?	Data Source	Station ID	Tag Group	Remarks
Scheme 1 (No assignment)	Not Used	Not Used	Not Used	Same as legacy object assemblies
Scheme 2	Not Used	Not Used	Selected By User	One of the tag groups defined for the object assembly is selected by the Operator at runtime.
Scheme 3	Not Used	Not Used	Selected By Tag Value	One of the tag groups defined for the object assembly is selected by an associated tag at runtime. This tag value may also be set by the operator (macro button?).
Scheme 4	Not Used	Selected By User	Not Used	One of the Station IDs defined for the object assembly is selected by the Operator at runtime (spinner?).
Scheme 5	Not Used	Selected By Tag Value	Not Used	One of the Station IDs defined for the object assembly is selected by an associated tag at runtime. This tag value may also be set by the operator (spinner?).
Scheme 6	Selected By User	Not Used	Not Used	One of the Data Sources defined for the object assembly is selected by the Operator at runtime (pull-down list?).
Scheme 7	Selected By Tag Value	Not Used	Not Used	One of the Data Sources defined for the object assembly is selected by an associated tag at runtime. This tag value may also be set by the operator (pull-down list?).
Other Schemes	?	?	?	A combination of above scenarios can be accomplished by other assignment schemes.

Object Assembly Copies in Designer

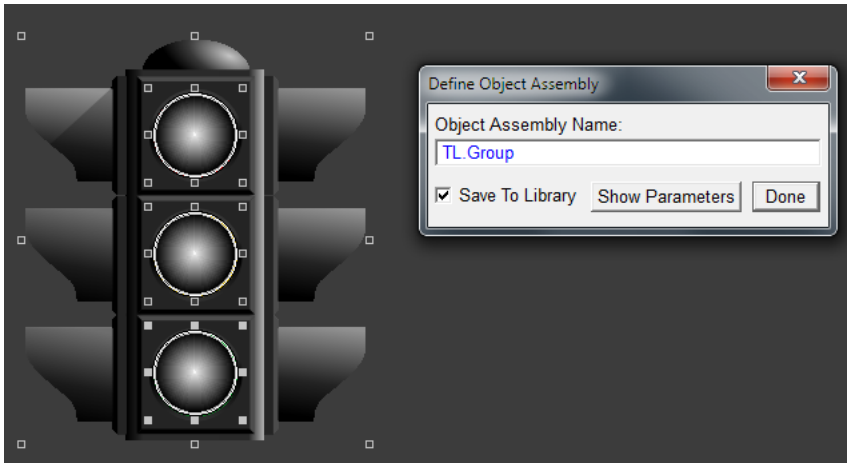
In the paragraph above, we illustrated several schemes to make a single Object Assembly take on different incarnations based on dynamic runtime association of multiple data sources, multiple

stations and multiple tag groups. Here, we illustrate how Object Assembly copies may be placed on the same screen with each copy taking on a different incarnation based on tag group assignment. It is easier to illustrate this with an example showing copies of a traffic light object assembly on the same screen.

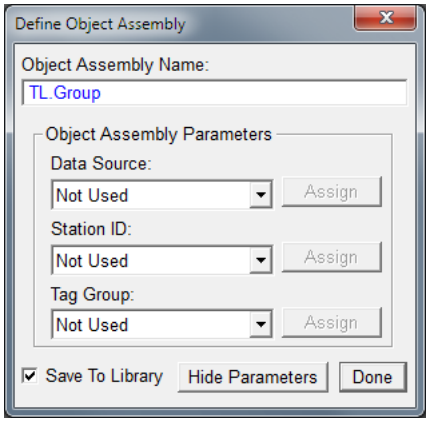
Step 1: Create a Traffic Light Object Assembly
As shown our Traffic Light object assembly consists of a background bitmap and 3 overlayed LEDs (Red Light, Yellow Light and Green Light) with 3 associated tags with values ON and OFF. Block select the group of objects as shown and right click to pop-up the menu and click on Make Object Assembly.



Step 2: Save Traffic Light Object Assembly in Object Assembly Library
Name the Object Assembly ('TL.Group' in our example) and check the box 'Save To Library'.

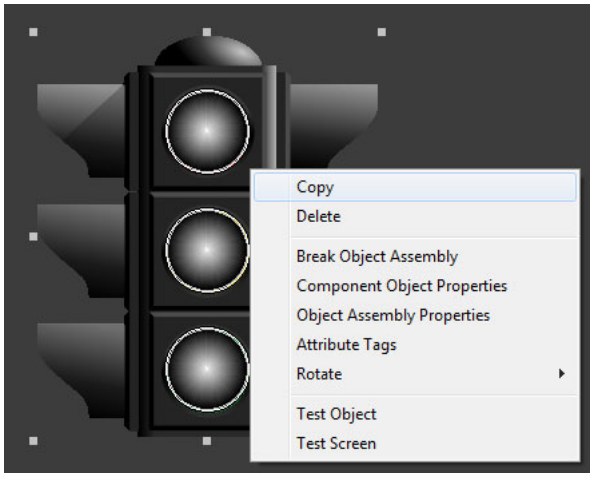


Note that if you click on 'Show Parameters' button you will see the expanded 'Define Object Assembly' dialog showing Object Assembly Properties, which we will not use in this step.

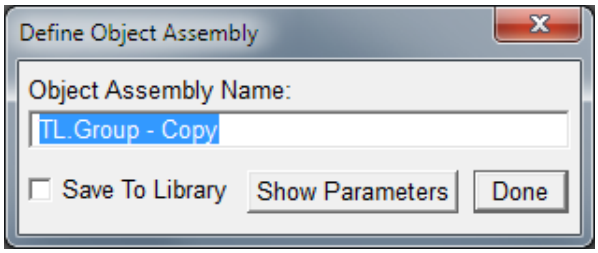


Click on Done button. This saves the object assembly 'TL.Group' (including 3 LEDs and 3 associated tags) in the Object Assembly library so it can be reused on this and other screens.

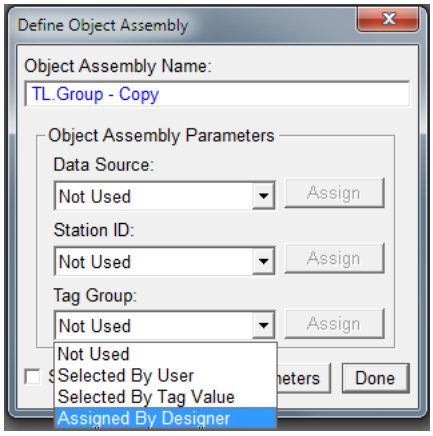
Step 3: Create a Second Traffic Light Object Assembly
To rapidly create a second traffic light on the screen, right-click the traffic light object assembly ('TL.Group') and click on the menu 'Copy'.



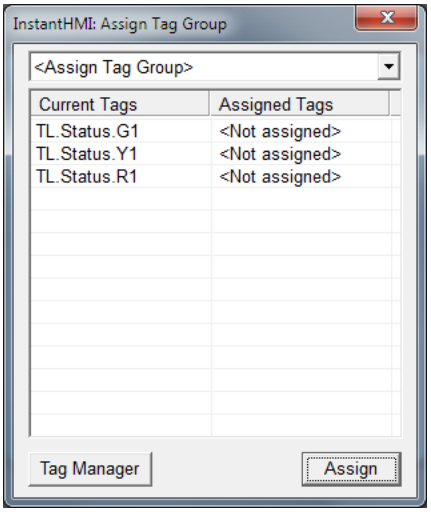
In the Define Object Assembly dialog the name 'TL.Group – Copy' will appear. This name is required only if object assembly is to be saved in the library. The name is filled in as a reminder to you that it is a copy of an object assembly already in the library and also to safeguard accidental overwrite of the original object assembly in the library. Note that, the 'Save To Library' is unchecked.

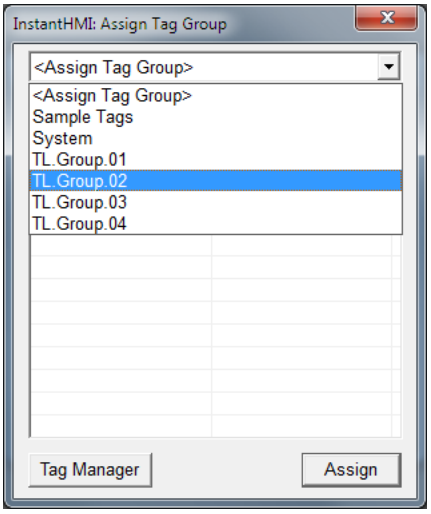


Step 4: Make Second Traffic Light Object Assembly Distinct from First
Click on 'Show Parameters' button and then click on Tag Group (pull-down list) and then click on the last option 'Assigned By Designer'.

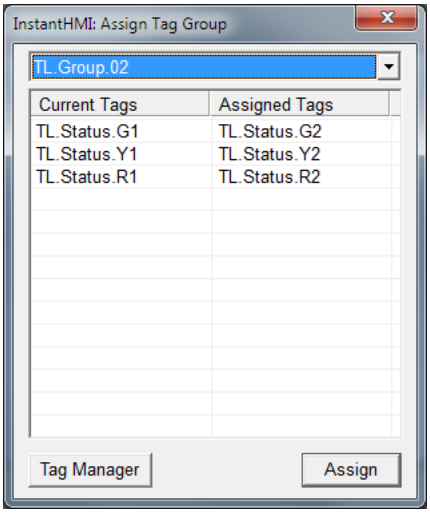


This will bring up the 'Assign Tag Group' dialog showing the Current Tags (in our example, TL.Status G1, TL.Status.Y1 and TL.Status.R1 from the Tag Group 'TL.Group 01'). Click on the 'Assign' button and select the new tag group (in our example, 'TL.Group 02'). Note: If the new tags and tag group are not already created, click on the 'Tag Manager' button and create the new tags and tag group.

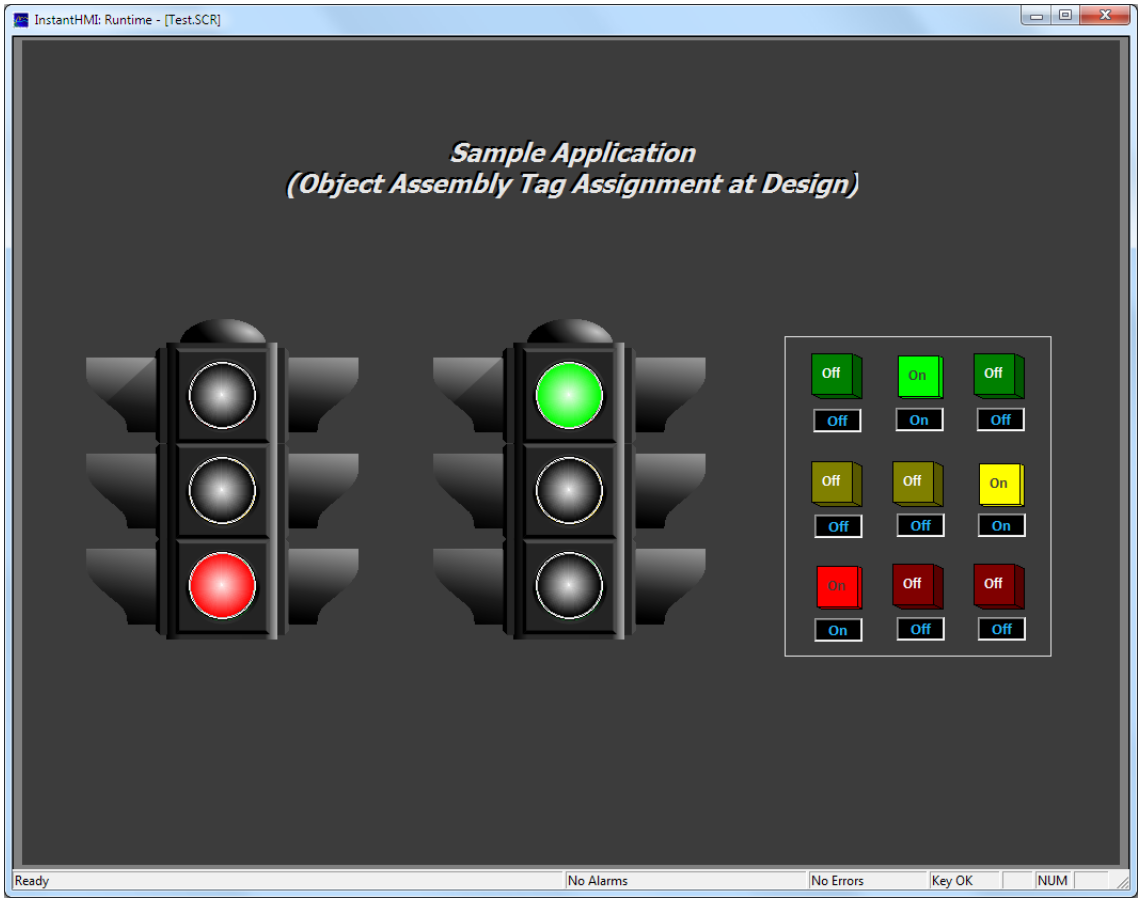




When the assignment is complete you will see the Current tags and the Assigned Tags in the 'Assign Tag Group' dialog. If you are satisfied with the tag assignments click on the Assign button to confirm.



Step 5: Save and Test Screen with Two Distinct Traffic Light Object Assemblies
Our screen has 2 distinct Traffic Light object assemblies and a panel of buttons to simulate and test different traffic light conditions. Note: A third extra set of buttons are included to test a 3rd distinct Traffic Light object assembly if desired.



4.6.5 Touch Zone Object

A Touch Zone Object defines a rectangular touch zone area on the screen. At runtime, the Touch Object on a screen may be activated in one of three ways:

- touch screen hardware is installed and the operator touches inside the zone,
- the operator clicks the mouse inside the touch zone, and
- the operator presses the key corresponding to the macro key code associated with the touch zone (if such a key exists on his keyboard).

Touch zone objects are useful to convert a screen into a control panel with graphical buttons to initiate various actions. You can associate two bitmaps with the touch zone object. These bitmaps represent how the touch zone will appear in the (normal) untouched state and the touched state. The purpose of these bitmaps is to give a visual feedback to the operator at runtime. Two actions can be associated with the touch zone: the first action to be taken when the touch zone is pressed, and the second action to be taken when the touch zone is released. Actions may be defined by associating macros (see Section 6) with the touch zone pressed and / or released. Note that you may be able to use the macros to affect the execution of selected functions in Scripts associated with the current screen. This feature can be used to set up simple touch zones to help the operator initiate complex actions.

Use the Touch Object tool (accessed from the Screen Designer menu **Objects → Touch Zone**) to create touch zone objects. To create the desired touch zone, locate and drag the mouse, as you would while drawing a box. A pop up dialog box (Figure 4-29) appears and allows you to specify two action macros to associate with the touch zone: one to correspond to the touch zone pressed and the other to the touch zone released (See Section 6 for details). If you do not need the action of both macros leave the “macro key for touch zone pressed” unused and specify only the “macro key for touch zone released”. Click on the "..." button to browse the available bitmaps for your project and select the filenames for the bitmaps to be used to represent the Up (untouched) and the Down (touched) state of the touch zone. (Use the 'Latch' check box to keep the touch zone latched in the touched-state as a reminder to the operator.) Note that instead of attaching any macros to the Touch zone, you may choose a 'switch to screen' action and select a screen to switch to. (This latter functionality is useful on runtime engines that do not support macros.)

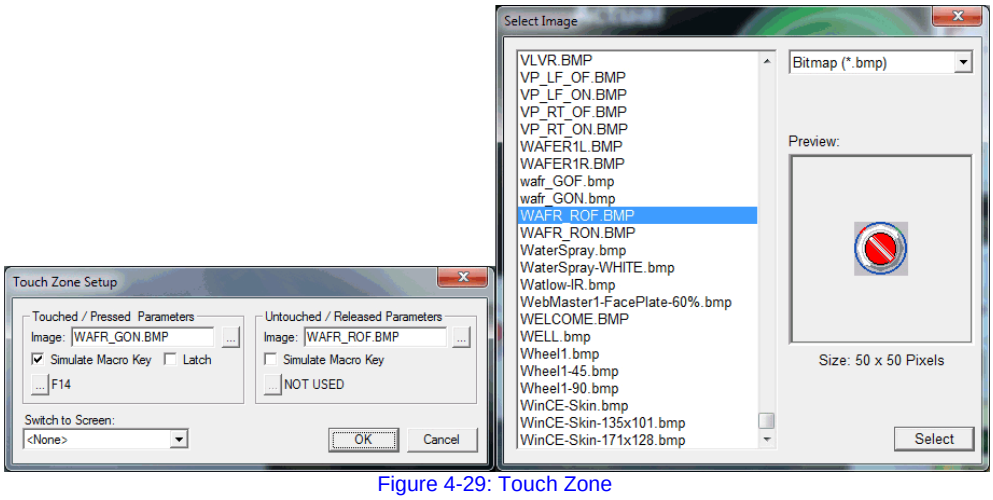


Figure 4-29: Touch Zone

Note: Use Windows Paint program, or some other application, to create your own bitmaps. You may also use what we have provided in the Demo project as the starting point for your bitmaps. InstantHMI includes a powerful Screen Capture utility (Section 3.5.1) which you may use for creating a bitmap collection for your project screens.

At runtime, you can test the touch zone pressed action by clicking and holding the mouse on the touch zone; to activate the touch zone released action you must release the mouse button before leaving the touch zone. You may also activate the touch zone by pressing the keys (if they exist on the keyboard) associated with the touch zone. At runtime, when the touch zone is activated, action corresponding to the associated keys will be initiated. For example, look at the Demo Project screen 'Training-mainmenu.scr'. Here we have associated the Switch to Screen 'Training-tmpzone1'

function with the touch zone having the appearance of 'Training-tmpzone1.scr'; no macro is associated with the touch zone since it is not required. At runtime, clicking (or touching if touch hardware is present) activates the touch zone on the Training-mainmenu screen to perform the 'switch to screen' function and switch you over to screen 'Training-tmpzone1'. In general, you could define the action for the touch zone by defining macros for the touch zone. The global macro file macros.idb in the Demo project includes all macros definitions.

4.6.6 Text Scroll Object

The Text Scroll tool allows you to place a Text Scroll object on screen and attach a Text File, which contains the text contents to display in the scrolling text box. You may also specify the foreground and background colors for the scrolling text; in addition, as shown in the Text scroll example below. You may control font size in any block of text by a preceding font size choice: large ('\l' at end of line), medium ('\m' at end of line)and small ('\s' at end of line). At runtime, the operator can select the scroll speed (freeze, slow, medium or fast) and scroll direction (up or down). (Not implemented in this version: You may use the object assembly concept to create an assembly to tie the text scroll box with a check list and action sequence.)

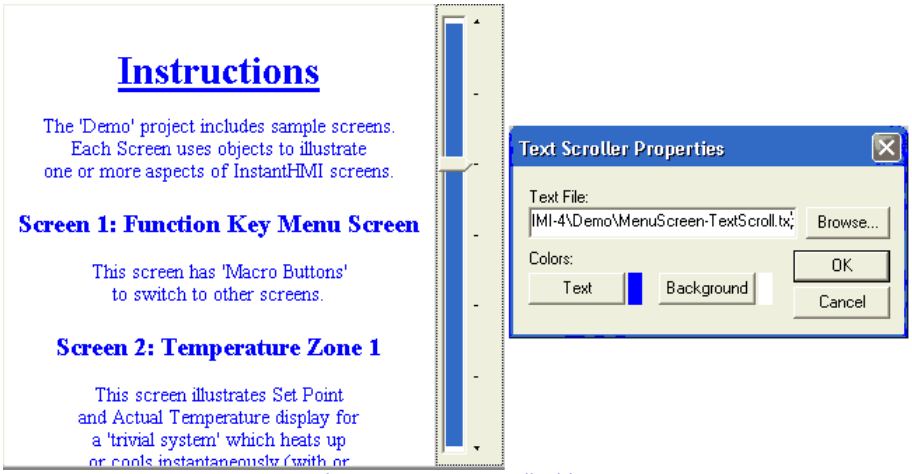


Figure 4-30: Text Scroll Object

```
/l
Instructions
/s
The 'Demo' project includes sample screens.
Each Screen uses objects to illustrate
one or more aspects of InstantHMI screens.
/m
Screen 1: Function Key Menu Screen
/s
This screen has 'Macro Buttons'
to switch to other screens.
/m
Screen 2: Temperature Zone 1
/s
This screen illustrates Set Point
and Actual Temperature display for
a 'trivial system' which heats up
```

4.6.7 Alarm Viewer Object

The Alarm Viewer tool allows you to place an Alarm Viewer object on the screen. This object is re-sizable but has no other settable properties except selection of columns and their order. Click on a column heading (example, ‘Type’) to pop-up a ‘Customization’ menu of Column Headings and Buttons with a check mark for selected columns and Buttons. Click on any selected column heading

to deselect it and vice-versa. At a minimum, Tag Name, and (Alarm) Status must be included. Likewise, the Buttons (Troubleshoot, Print, Ack Selected and Ack All) may be included or excluded from the Alarm Viewer Object. At runtime, all tags in alarm condition will be displayed in the Alarm Viewer. Using the Radio Buttons at the top, the operator can select to see the status of all 'Alarmed Tags', or 'Active Alarms', or 'Suppressed Alarms', or 'Alarm History'. Six different icons identify the tag alarm status. These are color coded Green for OK, Yellow for Alert, and Red for Critical. Two shapes are used: Circle for Normal and Triangle for Alert/Critical. When Acked these icons have an 'Ack' embedded in them. The tags currently in (High-High or Low-Low) critical alarm condition are marked with a Red icon . The tags currently in (High or Low) alert alarm condition are marked with a Yellow icon . The Acked alarms are marked with an 'Ack' superimposed on the icon depending on the current state of the tag . Tags in normal condition (not in alarm) are marked with a green 'OK' icon . The operator may click on a tag name to select it and click on the **Ack** button to acknowledge it. He may click on the **Ack All** button to acknowledge all tags in alarm condition. (See Section 17 and 'Show Alarms' macro in Section 6.3).
Note: Alarm Viewer now allows you to select the columns to display in the order desired. To select columns, right click on any column tab to display a list of all columns and then select the columns to display. Click on any column tab and drag it to re-order the columns.

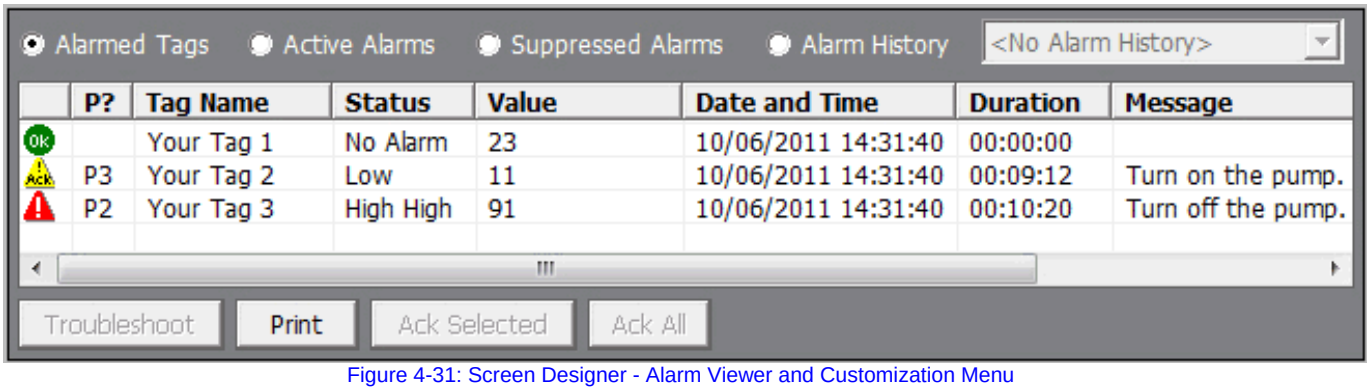

Alarmed Tags
Active Alarms
Suppressed Alarms
Alarm History
<No Alarm History>
P? Tag Name Status Value Date and Time Duration Message
Your Tag 1 No Alarm 23 10/06/2011 14:31:40 00:00:00
P3 Your Tag 2 Low 11 10/06/2011 14:31:40 00:09:12 Turn on the pump.
P2 Your Tag 3 High High 91 10/06/2011 14:31:40 00:10:20 Turn off the pump.
Troubleshoot
Print
Ack Selected
Ack All

Figure 4-31: Screen Designer - Alarm Viewer and Customization Menu

4.6.8 Real Time/Historic Trend

Select **Objects → Real Time/Historic Trend** to include a trend plot on your screen. This plot object includes both real time and historic views of the trend selectable on demand at runtime. Figure 4-32 shows example Plot Parameters for a trend plot after entering all the specifications. (You can get the desired plot by choosing appropriate plot parameters).

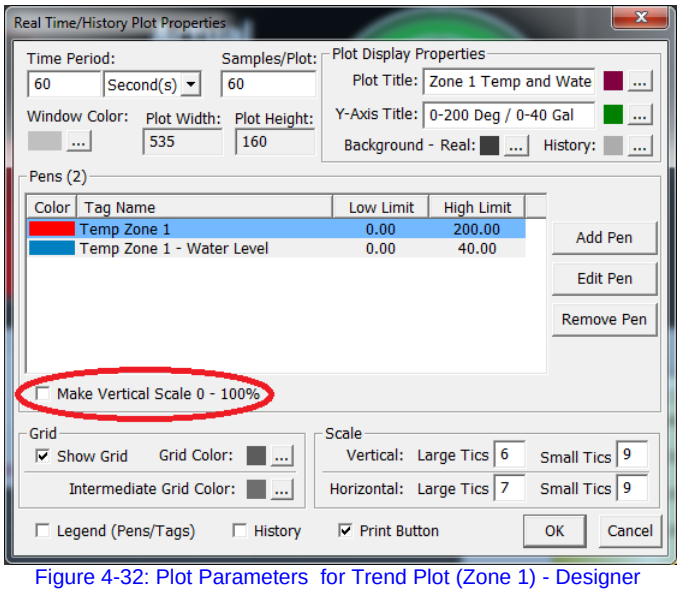


Figure 4-32: Plot Parameters for Trend Plot (Zone 1) - Designer

Specify Plot Width and Plot Height visually using object sizing. Enter the Time Period to be shown on screen, Units for time (seconds, minutes, hours or milliseconds), the number of Samples/Plot Period. You can enter the Plot Title and the (vertical) Y-axis Title. The (horizontal) x-axis will display the time intervals. You have a choice of colors for the text titles, plot window color, and plot backgrounds for both the real time and historic views.

Click on 'Add Pen' button, which pops-up a 'Select Tag' dialog so you can assign a tag to the pen. Click on 'Edit Pen' button to specify the Pen Color. You can also specify the data value corresponding to Low Value on the plot and High Value on the plot; these will be used to scale the plotted trends automatically.

Repeat this process for all the pens (2 pens in the 1st example and 4 pend in the 2nd Example) you wish to include on the plot.

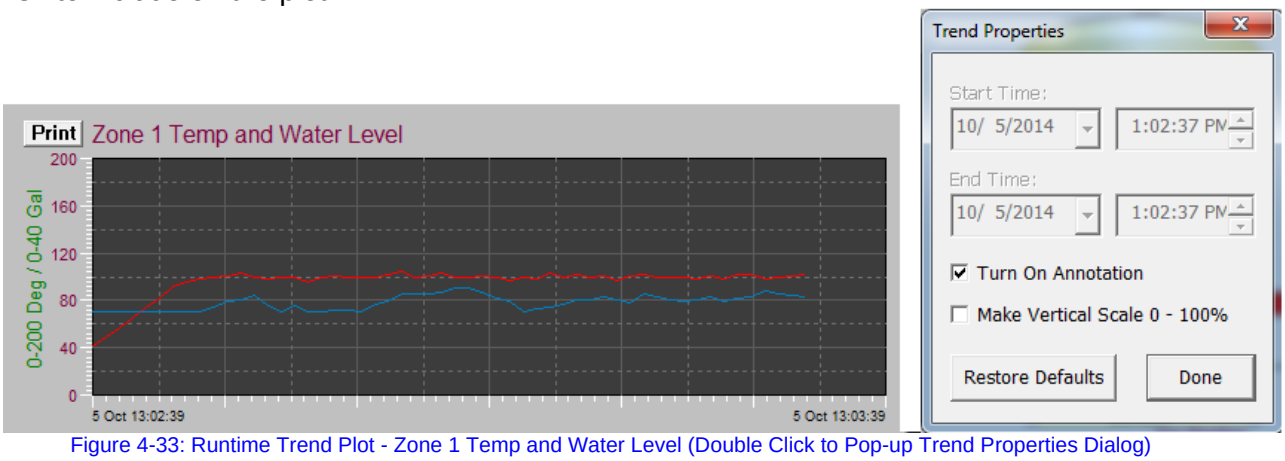


Figure 4-33: Runtime Trend Plot - Zone 1 Temp and Water Level (Double Click to Pop-up Trend Properties Dialog)

A maximum of 16 pens per plot object may be specified, but we do not recommend using more than about 4 pens (as in the 2nd example below, which includes the Legend for the 4 pens) to avoid clutter and overlaps of the traces in the plot.

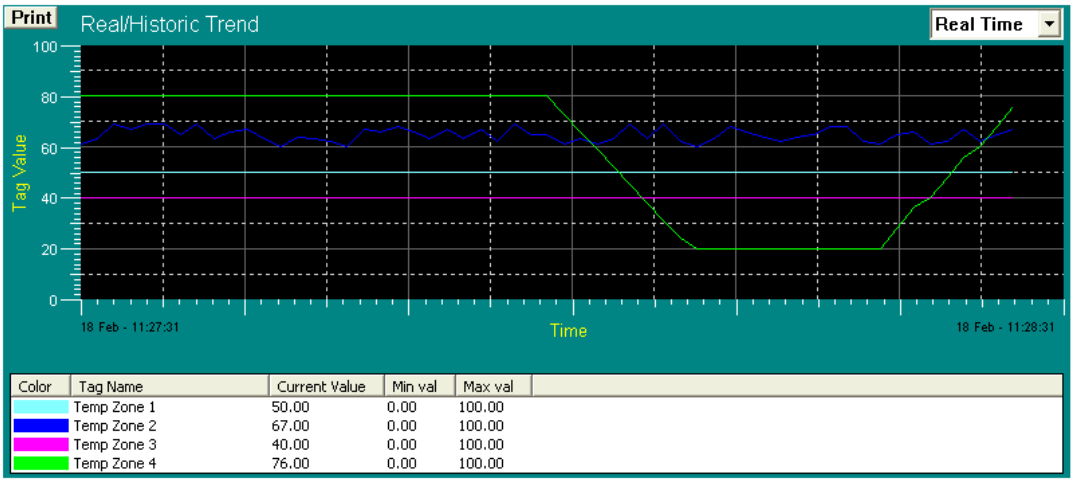


Figure 4-34: Plot Widget Sowing Real Time Trend at Runtime

Until Version 6.1.32, the vertical scale was set to range from the lowest limit of all pens to the highest limit of all pens. If the ranges for the individual tags (in engineering units) were order of magnitude different, then the trace of one or more pens will show hardly any variability to be of practical use. In addition, the plot display was not allowed to be edited at Runtime. To overcome this shortcoming, Version 6.1.32 (and later) allows user another choice: 'make vertical scale 0 – 100%' to represent tag value range of each pen. In Screen Designer, you can select the Ranges for Pens and initial Scale mode (0-100% or range of tag values). This can be changed dynamically at Runtime: simply double click on the trend plot and change vertical Scale mode. Note: If the plot legend were included, then at Runtime you can double click on each Tag and change its absolute Range. This allows for vertical shift (and implicit magnification).

You may select the grid colors and the number of tics for the x-axis and y-axis scales. You may choose to include a Legend (listing the pens, tag names and values, etc.) below the plot area. You may also choose to include History view; this allows the runtime operator to select Runtime/History view from a pull down menu included in the top right of the runtime plot view. When all the specs needed for the plot are finished click on the OK button.

You will see a plot object on the design screen. If this is not what you want, you may select it and resize it or go back and edit the specs for the plot using the Edit Select option (double click on the Plot data field). Select the Real Time/History view from the pull-down menu at the top to check out the two views the operator can select at run time. Note that the History view includes a scroll bar at the bottom of the plot that the operator can use to review the historic trend over any time period he selects.

Note: Trend object will be modified to maximize plotting area within the object when title is blank and History (and/or Legend) is turned off. (A check box allows show/hide of Print Button at bottom).

4.6.9 OLE Object

OLE (Object Linking and Embedding) technology can be used to create compound documents (Example: Embedded Excel Worksheet in an InstantHMI Screen). The InstantHMI Screen Designer and PC Runtime Engine are OLE containers. OLE containers are applications that manage, in addition to native data, a set of OLE server items. Screen Designer supports multiple-embedded OLE objects, and allows you to select and edit any of them. We discuss OLE Objects here; ActiveX Objects are discussed in Section 4.6.10).

Creating OLE Objects

The Screen Designer as a OLE container will allow you to insert OLE objects into the screen document. Use the 'Objects → OLE Object' command to insert a new OLE object on your screen. When you choose this command you will see the Insert OLE Object dialog box shown.

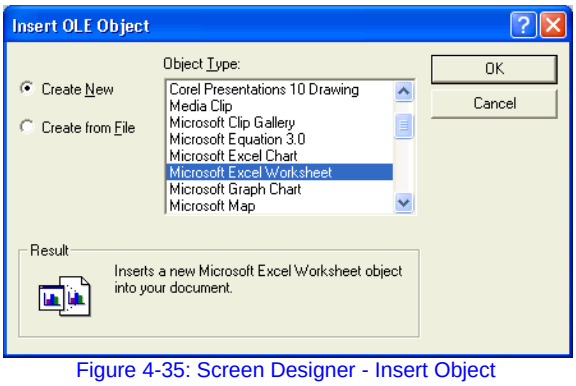


Figure 4-35: Screen Designer - Insert Object

Select the object type you wish to insert in the Screen and click OK. This will create a place holder rectangle ('container') for the object type you selected (example: Excel Worksheet). If you right click on this rectangle you will access the OLE Verbs menu appropriate for the inserted OLE object (Section 4.6.11). When finished creating the document object return to the Screen Designer (the ESC key would usually work or you may click outside the OLE object on the screen).

The container rectangle (for an OLE object) is like any other object on the screen. You may select, move or resize the object on the screen.

Editing OLE Objects

To avoid confusion with non-OLE object commands (example, Edit → Copy Object) the OLE Edit commands are accessed only by right clicking the OLE container rectangle; they are not accessible from the Edit menu.

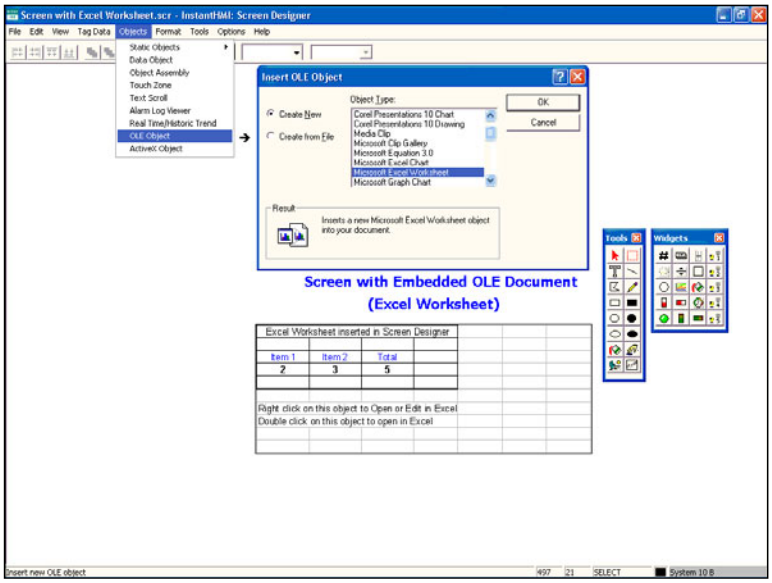

Screen with Excel Worksheet.scr - InstantHMI: Screen Designer
Insert OLE Object
Screen with Embedded OLE Document
(Excel Worksheet)
Excel Worksheet inserted in Screen Designer
Right click on this object to Open or Edit in Excel
Double click on this object to open in Excel

Figure 4-36: Example Screen with Inserted OLE Document (Excel Worksheet)

Figure 4-35 shows an 'Example Screen with Inserted OLE Document (Excel Worksheet)'. To access the OLE edit properties that have been exposed to the container by the OLE document's application (Excel in our example), right click on the OLE document object to pop up its OLE Edit Functions as listed below.

Copy	Copy the selection and put it on clipboard.
Delete	Delete selected object.
OLE Object →	(Example 'Worksheet Object') OLE Verbs
Animate Control	Assign InstantHMI Tags/Scripts to Control Object.

Figure 4-37: OLE Edit Functions

Copy

Use this option to copy the OLE object. After the object is selected, hold down the left mouse button and drag the outline of the bounding rectangle to the desired location. Release the mouse button to finish. Hit the ESC key to deselect all selected objects.

Delete

Use this command (or the Del key) to delete any selected OLE object from your screen.

OLE Object

When you select this command you will see a list of the OLE verbs (Edit, Open etc. See Section 4.6.11) applicable to the selected 'OLE' object ('Worksheet' in our example). When you select an OLE verb the OLE application (Excel in our example) that created the OLE object will run and allow you to perform the OLE verb (Edit, Open etc.) on the OLE document.

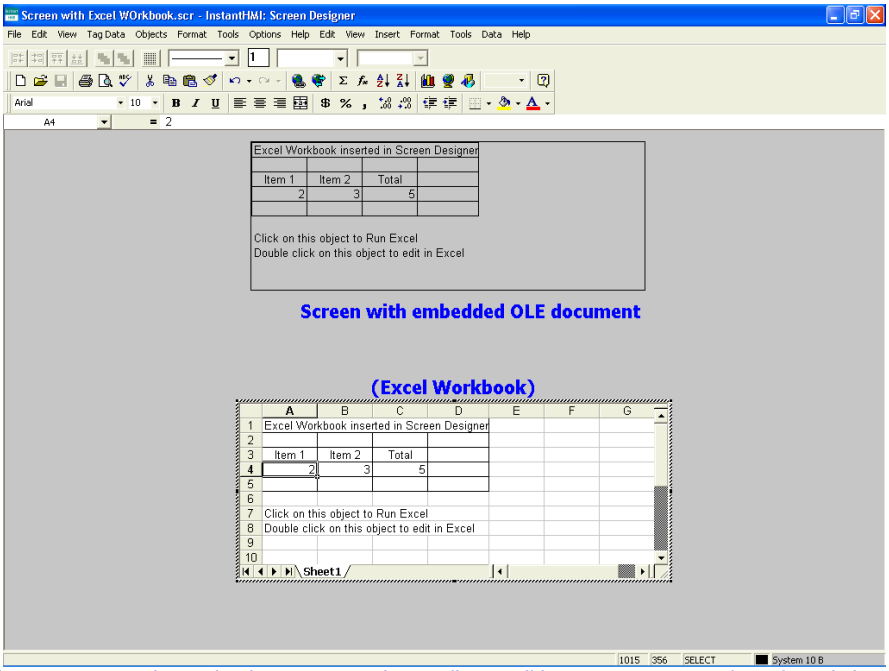


Figure 4-38: Excel Running in Screen Designer Allows Editing OLE Document (Excel Worksheet)

Note that the Excel Menus and Tool Bars appear along with Screen Designer Menu and Tool Bars. You may use them to edit the inserted OLE (Excel Worksheet) document. When you exit Excel you will see the edited worksheet document incorporated in the screen document.

Animate Control
See Section 4.6.10.

4.6.10 ActiveX Object

As stated earlier, OLE technology can be used to create compound documents. OLE2, the next release of OLE, introduced COM (Component Object Model), which defines a common communication protocol for objects to interact with each other based on abstract interfaces. This enabled application developers to use COM in ways that had nothing to do with OLE. In 1996, Microsoft coined the term ActiveX to refer to a set of COM based technologies. ActiveX controls inherit much of their design (and reputation for being among the most complex COM objects) from the larger and more complex OLE documents, which allow applications to embed their data transparently in other applications. This implies several complex interactions, including inter-process communication. Controls were introduced as an in-process special case version of OLE documents, which made them immediately usable by containers that knew how to embed OLE documents.

An ActiveX control is just another term for an OLE Control Object or COM Object. In general, ActiveX Controls are COM objects with an User Interface. The term OLE reverted back to the OLE technologies that apply to object linking and embedding. An OCX is a file that can hold one or more ActiveX controls. Since other files (example, .DLL files) may also hold one or more ActiveX controls, these controls should not be referred to as OCXs.

ActiveX controls are designed to behave much like native Windows controls. You may integrate your (or third party) ActiveX components into InstantHMI screen documents. In general, InstantHMI container should be able to ask the ActiveX control to Create its window, Toggle the window's display, Set the window size, Get the window size and Destroy the window. ActiveX controls can also provide methods and notifications that the InstantHMI containers can call and respond to.
We recommend that you test your control with InstantHMI containers for possible use in your application. If a control requires the support of a component category to perform its designated function, that category should be entered as a requirement in the Windows Registry to ensure that

an inappropriate control will not be inserted in an InstantHMI screen document serving as a container.

The Screen Designer, as a container, offers many ways to setup the ActiveX control:

- Insert ActiveX Control objects into the screen document
- Edit the control properties that have been exposed to the container by the control's Property Dialog and by interacting with the control in-place (not all controls support in-place activation).
- Setup Animation of the ActiveX object if the control has exposed interfaces for the container to interact with the properties of the control. The basis for animating the control may involve assigning InstantHMI Tags to Control Properties and designating Script execution to be triggered by Control's property change events. (The actual animation will take place in the Runtime Engine.)

Creating ActiveX Objects

The InstantHMI Screen Designer and PC Runtime Engine are ActiveX containers. The Screen Designer as a container will allow you to insert ActiveX Control objects into the screen document. Use the 'Objects → ActiveX Object' menu to insert a new ActiveX object on your screen. When you choose this menu command you will see the Insert ActiveX Object dialog box shown. For inserting ActiveX control object, the 'Create Control' option must be selected. For inserting OLE objects proceed as discussed in Section 4.6.8.

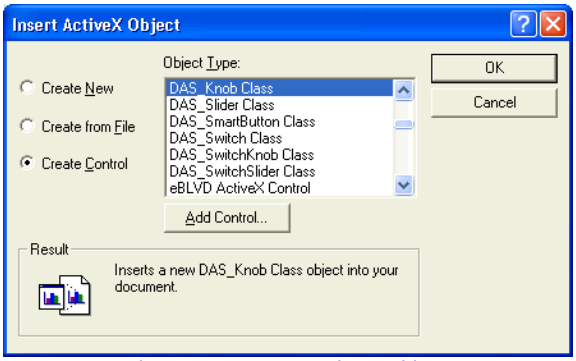


Figure 4-39: Insert ActiveX Object

(If you do not see the ActiveX control object you wish to insert on the screen click on the Add Control button and browse to locate the control (usual file type is .DLL or .ocx) and add it so it will show up in the list.) Select the ActiveX control object type you wish to insert in the Screen and click OK. This will create a place holder rectangle ('container') for the object type you selected (example: DAS_Knob Class). If you right click on this rectangle you will access the ActiveX Verbs menu appropriate for the inserted ActiveX object (Section 4.6.11). When finished creating the control object return to the Screen Designer (the ESC key would usually work or you may click outside the ActiveX object on the screen).

The container rectangle (for an ActiveX object) is like any other object on the screen. You may select, move or resize the object on the screen.

Editing ActiveX Objects

To avoid confusion with non-ActiveX object commands (example, Edit → Copy Object) the ActiveX Edit commands are accessed only by right clicking the ActiveX container rectangle; they are not accessible from the Edit menu.

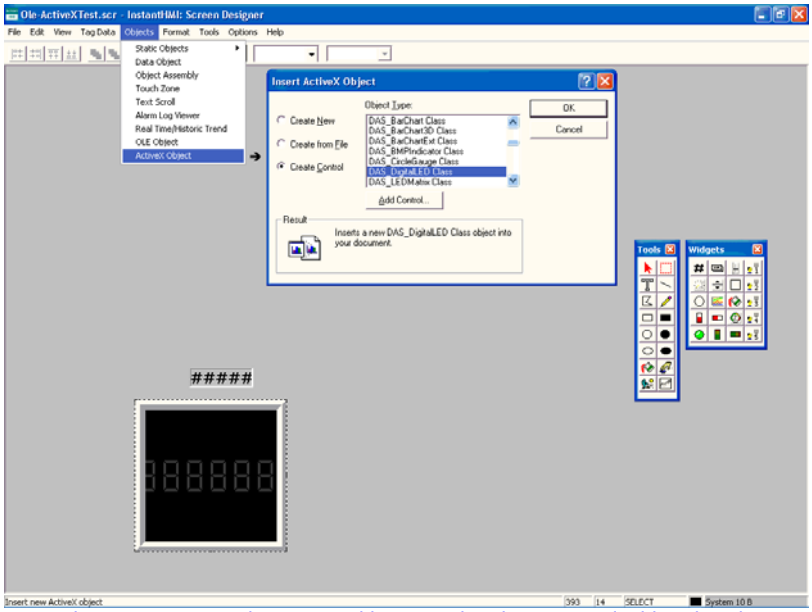


Figure 4-40: Example Screen with Inserted ActiveX Control Object (LED)

Figure 4-39 shows an 'Example Screen with Inserted ActiveX Control Object (LED)'. To access the ActiveX edit properties that have been exposed to the container by the ActiveX control application ('DAS' in our example), right click on the ActiveX control object to pop up its ActiveX Edit Functions as listed below.

Copy	Copy the selection and put it on clipboard.
Delete	Delete selected object.
Properties '…' Object →	(Example 'DAS_LED Class') ActiveX Properties
Animate Control	Assign InstantHMI Tags/Scripts to Control Object.

Figure 4-41: ActiveX Edit Functions

Copy

Use this option to copy the ActiveX object. After the object is selected, hold down the left mouse button and drag the outline of the bounding rectangle to the desired location. Release the mouse button to finish. Hit the ESC key to deselect all selected objects.

Delete

Use this command (or the Del key) to delete any selected ActiveX object.

Properties 'Inserted' Object

When you select this command you will see a Property Dialog exposed to the container by the ActiveX control. (In our example: 'DAS_DigitalLED Class Object' Properties dialog appears as shown below. Your dialog will depend on your ActiveX control.)

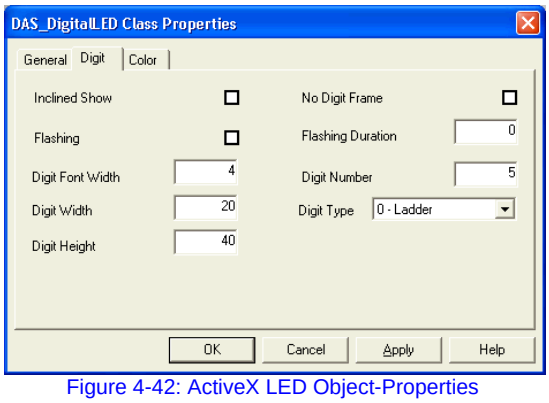


Figure 4-42: ActiveX LED Object-Properties

Note: When you select some ActiveX controls on screen you may only see a placeholder rectangle selected. The LED control, for example, will show itself when you hold the control key and double click on the object.

Animate Control

If you select the Animate Control menu you will see the 'Animate Control Setup' dialog (see LED Example in Figure 4-39). This dialog lists all the Properties and Events exposed by the ActiveX control to its container. Any properties exposed by the control (such as value displayed by the LED object) may be assigned an InstantHMI Tag by double clicking on it, which brings up the Property Setup dialog shown. In this dialog, you assign a Tag ('LED Value'). The data will be transferred From Tag to the LED property 'Value'. You may also assign a script to be executed if the control provides access to the Property Change event.

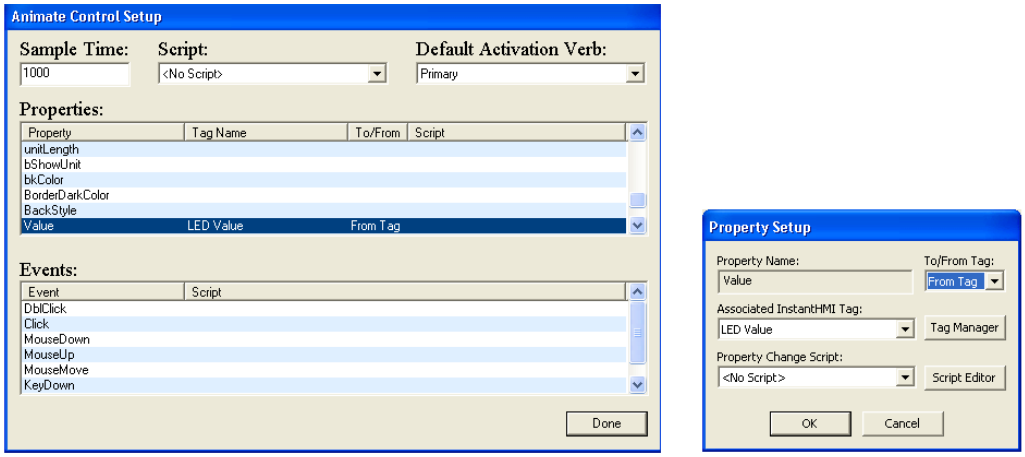


Figure 4-43: ActiveX LED Object-Animation Setup

Similarly, any Events exposed by the control such as mouse events (click, double click, etc.), key events (key down, key up, etc.), and custom events (Setpoint Change etc.) may also be assigned scripts through the 'Setup' dialog.

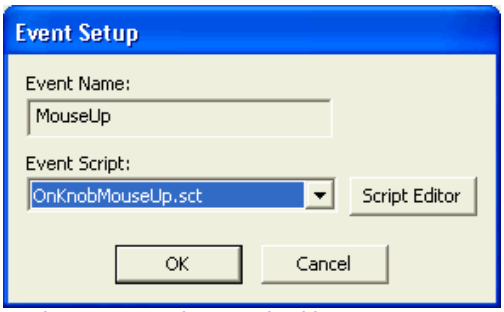


Figure 4-44: ActiveX Knob Object-Event Setup

Similar to object scripts assigned to other standard data objects, an object script may also be attached to the embedded control object, to be executed at the object sample time in the Runtime. Two new script functions (Section 7) support getting and setting of control properties:

- ActiveXGetProperty(PropertyName)
- ActiveXSetProperty(PropertyName, Value)

The data for the control property may be transferred to the associated InstantHMI Tag or from the Tag to the control. If you have selected to transfer data 'From Control **To Tag**' the data associated with that property will be transferred (at the specified control sample time) from the control to the (Data source of the) tag assigned to that property. If you have selected to transfer data '**From Tag** To Control' the data will be sampled from the assigned tag's Data Source and transferred to the control. If the control generates an event that notifies the container that a property value has changed, the associated script will be executed for any special handling needed for this event.

ActiveX Verbs
See Section 4.6.11.

4.6.11 OLE/ActiveX Verbs

OLE/ActiveX controls must be activated before the user can interact with the control. The user interaction will be determined by the verb used to activate the control. The standard predefined verbs are tabulated below.

ID	Do Verb	Description
0	Primary	Action performed when user double-clicks the object in InstantHMI Runtime. The object, not the Runtime, determines this action. If the object supports in-place activation, the primary verb usually performs this action.
-1	Show	Instructs an object to show itself for editing or viewing. Called to display newly inserted objects for initial editing and to show link sources.
-2	Open	Instructs an object, including one that supports in-place activation, to open itself for editing in its own window distinct from the container's window. If the object does not support in-place activation, this verb has the same action as Show.
-3	Hide	Causes an object to remove its user interface from the view. Applies only to objects that are activated in-place.
-4	UIactivate	Activates an object in place, along with its full set of user-interface tools, including menus, toolbars, and its name in the title bar of the container window.
-5	InPlaceActivate	Activates an object in place without displaying tools, such as menus and toolbars, that users need to change the behavior or appearance of the object. Single-clicking such an object causes it to negotiate the display of its user-interface tools with its container. If the container refuses, the object remains active but without its tools displayed.

InstantHMI obtains the custom verbs supported by a control (identified with ID values 1 and above) by enumerating the verbs of the control. The Primary verb is defined by the control itself and activates the control for its main purpose. In most cases the Primary verb for OLE objects is 'Edit' (Examples: Word Document and Excel worksheet objects). An exception to this is the Sound Recorder object, whose primary verb is a custom verb 'Play', which plays the sound associated with the object.

In InstantHMI runtime, when you single-click an embedded control the verb specified as the 'Default Activation Verb' will be invoked. If the user double clicks the control the 'Primary' verb is invoked. If the user holds the control key down and double clicks the control, the 'Open' verb is invoked. If the user right clicks the control the runtime pops up a menu to allow the selection of the custom verbs supported by the control.

InstantHMI Container invokes the Do Verb as part of initializing a newly created object. (InstantHMI first informs the object of its display location and alerts the object that it is an embedded object so as to trigger appropriate changes to the user interface of the object application in preparation for opening an editing window.) The Do Verb automatically runs the OLE server application. If an error occurs during verb execution, the object application (Excel, Word, etc.) is shut down.

4.6.12 Spreadsheet Viewer Object

The Spreadsheet Viewer tool allows you to place a Spreadsheet Viewer object on the screen which allows the viewing of data files generated at Runtime. This object is re-sizable. To access the properties dialog for this object, right click on it and select Component Object Properties. (You may also double-click anywhere on the shaded border area of the object, but not inside any of its components such as the display area, pull-down list, Print button, etc.). In the Properties dialog, select File Type (CSV, Spool or Text), File Name (example, IHMI*.CSV), and Delimiter (Comma, Tab, Space, etc.) used in data file to separate fields; these selections help the operator at Runtime to select and view useful data files as needed. You may also set the Viewer Title, Colors for the Title and Data, and select to include Print button and/or Config button. The Properties shown in the dialog result in the ‘Gas data Viewer’ as shown.

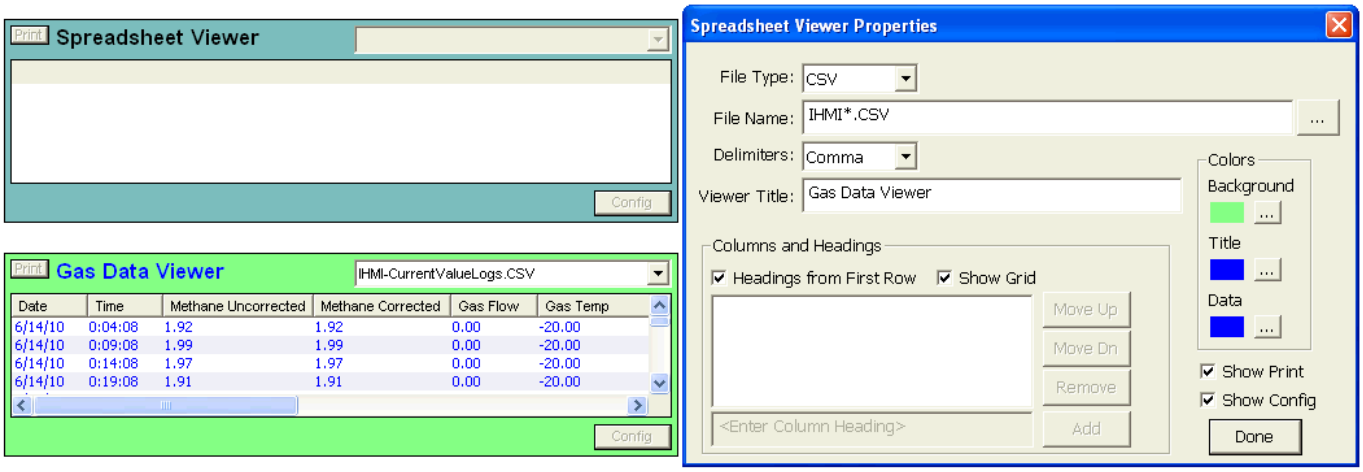


Figure 4-45: Screen Designer - Spreadsheet Viewer

At runtime, the data from the selected file will be displayed in the data display area. From the pull-down menu at the top, the operator can select to view any of the file types pre-selected at design time . Further, the **Config** button allows the filtered selection of data based on Date (must be column 1, in the format month/date or month/date/year) and Time (must be column 2, in the format hour:min with or without seconds); the **Print** button will print the visible contents of the viewer.

4.7 Format

The **Format** Menu has the following commands:

Patterns	Set the patterns for pen and filled objects.
Color	Set the color for pen, filled objects, etc..
Font	Set the display font type, size etc. for text.

4.7.1 Patterns

The **Patterns** menu offers the following commands to set patterns for pen and filled object styles.

Pen	Set the pen style and size (width).
Filled Object	Set the fill pattern for filled objects.
Text Display Mode	Set the display mode for text.

Pen

The **Patterns → Pen** menu offers the following commands to set the drawing pen size and style:

Solid	Set the pen style to solid.
Dashed	Set the pen style to dashed.
Dotted	Set the pen style to dotted.
Dash and one dot	Set the pen style to one dash and one dot.
Dash and two dots	Set the pen style to one dash and two dots.
Size...	Specify pen width through a popup dialog box.

Filled Object

The **Patterns → Filled Object** menu offers the following commands to set the fill patterns for filled objects:

Solid	Set the fill style to solid.
Horizontal Hatch	Set the fill style to horizontal hatch.
Vertical Hatch	Set the fill style to vertical hatch.
FDiagonal Hatch	Set the fill style to forward diagonal hatch.
BDiagonal Hatch	Set the fill style to backward diagonal hatch.
Cross Hatch	Set fill style to cross hatch.
Diagonal Cross Hatch	Set fill style to diagonal cross hatch.

Text Display Mode

The **Patterns → Text Display Mode** menu offers two choices:

Opaque	Make Text Background Opaque.
Transparent	Make Text Background Transparent.

The Text object has a foreground color and background color. You may think of this as writing the text with a (foreground color) pen on a (background color) placard. Normally, the placard is opaque and hence its color (the text background color) hides the object behind it. You may use the Select tool to select any text you entered on screen and set its Text Display Mode to Transparent which makes the usually opaque text placard to be transparent so you can see through behind the text object. You may switch the text display mode as often as you like.

4.7.2 Color

The **Color** menu offers the following commands to set color properties of objects:

Pen	Set the pen color.
Fill	Set the color of filled objects.
Text Foreground	Set foreground color of text objects.
Text Background	Set background color of text objects.
Hatch Lines	Set hatched line color of hatched objects.
Screen Background	Set application screen background color.

The Status Bar indicates current colors for text and pen. In addition to the standard Windows **Color Dialog**, InstantHMI has internally defined RGB color combinations as shown in the color chart below. If you are asked to enter a color number you may use this chart. The colors in this chart will be displayed when a register value (int:0-16 or long: 24-bit rgb value) is used to display a color on screen at runtime.

COLOR CHART				
Color	Ref. Number	R	G	B
Black	0	0	0	0
Blue	1	0	0	255
Green	2	0	255	0
Cyan	3	0	255	255
Red	4	255	0	0
Magenta	5	255	0	255
Brown	6	128	64	0
Light Gray	7	208	208	208
Gray	8	192	192	192
Light Blue	9	128	128	255
Light Green	10	128	255	128
Light Cyan	11	128	255	255
Light Red	12	255	128	128
Light Magenta	13	255	128	255
Yellow	14	255	255	0
White	15	255	255	255

When you choose any **Color** menu command you will see a Color Dialog box to help you choose color. Click on one of the 48 Basic color choices. Custom colors (16 choices) are also implemented in Screen Designer. To use custom colors, click on one of the 16 custom color boxes, mix the custom color (by clicking on the Define Custom Color button and then setting the Hue, Saturation and luminance) and then click the Add Custom Color button. The custom color you mixed will appear in the custom color box and thereafter it can be used just like the basic colors. You may define up to 16 custom colors for a screen and use them for the screen objects in addition to the 48 basic colors. When you are done, click the OK button.

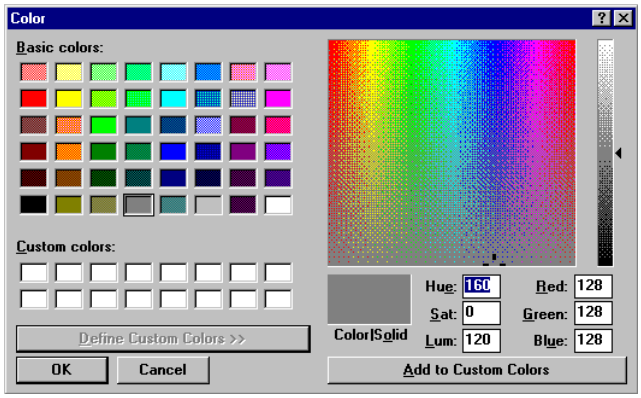


Figure 4-46: Color Dialog

Pen (Drawing) Color

The **Color → Pen** menu is used to draw line objects, the outlines of graphic objects such as Boxes and Circles etc. This command pops up the Color Dialog box to select a new pen color. If an object is currently selected, this command will change only the pen color for the selected object. If no object is selected, then this command will set the pen color for all subsequently created objects that use the pen.

Fill Color

The **Color → Fill** menu is used to color fill solid objects such as filled boxes and filled circles etc. This command pops up the Color Dialog box to select a new fill color. If an object is currently selected, this command will change only the fill color for the selected object. If no object is selected, then this command will set the fill color for all subsequently created filled objects.

Text Foreground Color

This **Color → Text Foreground** menu item is used to change the foreground color of static text objects. This command pops up the Color Dialog box to select a new text foreground color. If a text object is currently selected, this command will change only the foreground color for the selected object. If no object is selected, then this command will set the text foreground color for all subsequently created text objects. **Note:** To change the foreground color of data objects, use the color button in display object properties dialog.

Text Background Color

This **Color → Text Background** menu item is used to change the background color of static text objects. This command pops up the Color Dialog box to select a new text background color. If a text object is currently selected, this command will change only the background color for the selected text object. If no object is selected, then this command will set the text background color for all subsequently created text objects. **Note:** To change the background color of data objects, use the color button in the display object properties dialog.

Hatch Lines Color

The **Color → Hatch Lines** menu item is used to draw filled objects that are assigned a hatched pattern. This command pops up the Color Dialog box to select a new hatch lines color. If a filled hatched object is currently selected, this command will change only the color of the hatched lines for the selected object. If no object is selected, then this command will set the hatched line color for all subsequently created filled hatched objects.

Screen Background Color

The **Color → Screen Background** menu item is used to clear (fill) the entire application screen before the screen objects are displayed. This command pops up a dialog box to select a color for the screen background. You may set the screen background even after you have created objects on the screen.

Note: You may change Color for (multiple) selected objects.

4.7.3 Font

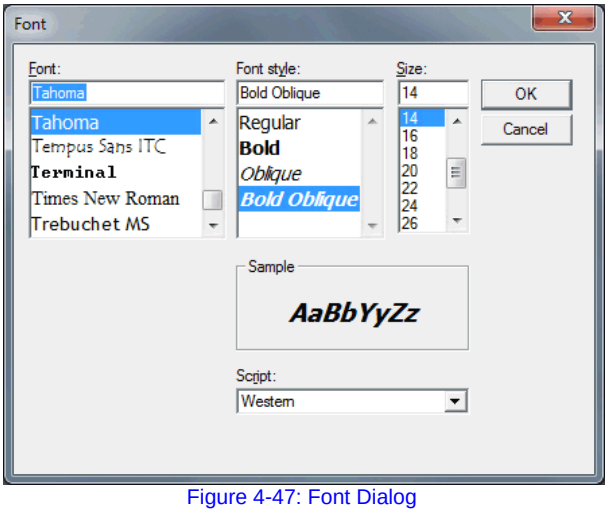


Figure 4-47: Font Dialog

The **Font** command pops up a standard dialog box to select a font type, style and size to use for text objects. Note: To set the font type, style and size for data objects, use the Font button in the data display object properties dialog box.

Screen Designer-displays the standard windows Font dialog box. You choose the Font Type, Font Style and Font Size and then observe the Font sample displayed; when satisfied with your selection click on OK button to return to your application screen. Note: You may change Font for (multiple) selected objects.

4.8 Tools

The **Tools** menu allows you to access the companion utilities that come with InstantHMI from the Screen Designer. These Tools are discussed in greater detail in other Sections as indicated.

Report Designer	See Section 5
Macro Manager	See Section 6
Script Editor	See Section 7
Screen Capture	See Section 3.5.1

Note: These Tools may also be accessed directly from the LaunchPad → Design mode dialog.

4.9 Options

The Options menu offers the following commands to configure InstantHMI:

Tabbing Order	Set tabbing order for keyboard input via data Input objects.
Customization	Customize default parameters in Screen Designer.
Password	Set screen password.

4.9.1 Tabbing Order Option

The tabbing order command displays on the current screen the labels for each data input field as a number tag in the top left corner of the data object. This number is the relative order in which the operator can access (set keyboard focus to) the data objects. To change the tabbing order, just point to the tag on the data item you want to be the first in the tabbing order and click the left button; repeat for the next data item and so on. When you are satisfied with the displayed tabbing order press the Enter key. Press the Esc key to cancel the changes you made and return to the previous tabbing order. At runtime the operator will be able to enter data in the tabbing order you have setup.

4.9.2 Customization Option

This command pops up a tabbed dialog box to help you setup the default choices for Colors, Text, Patterns, View and Object Assemblies as shown below. The parameters you set will be in effect each time you run Screen Designer subsequent to your customization.

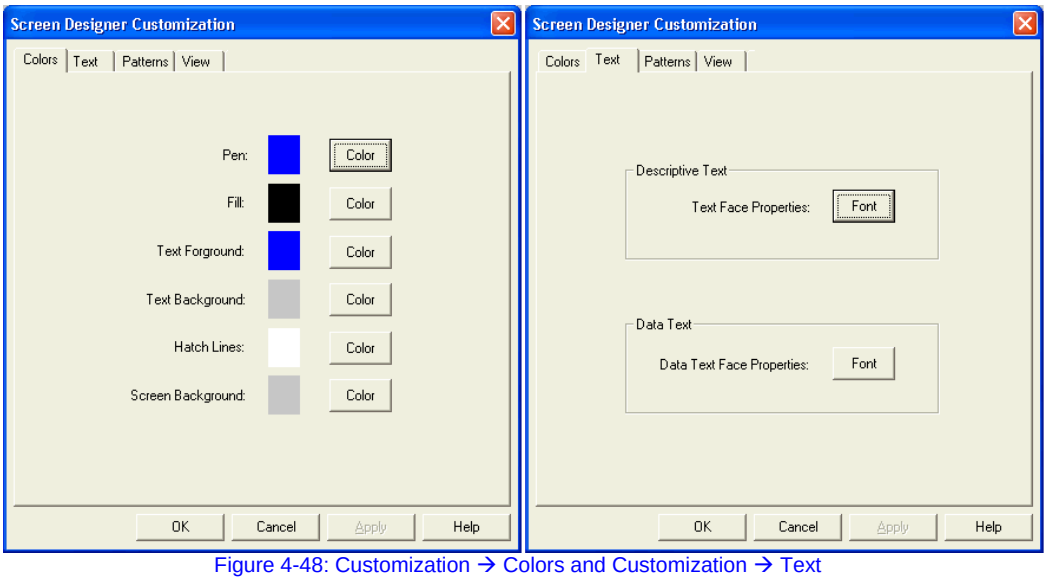


Figure 4-48: Customization → Colors and Customization → Text

The Customization → Colors tab allows you to set the default colors for Pen, Fill, Text Foreground, Text Background, Hatch Lines and Screen Background. The Customization → Text tab allows you to set the default fonts for Descriptive Text (static text) and Data Text.

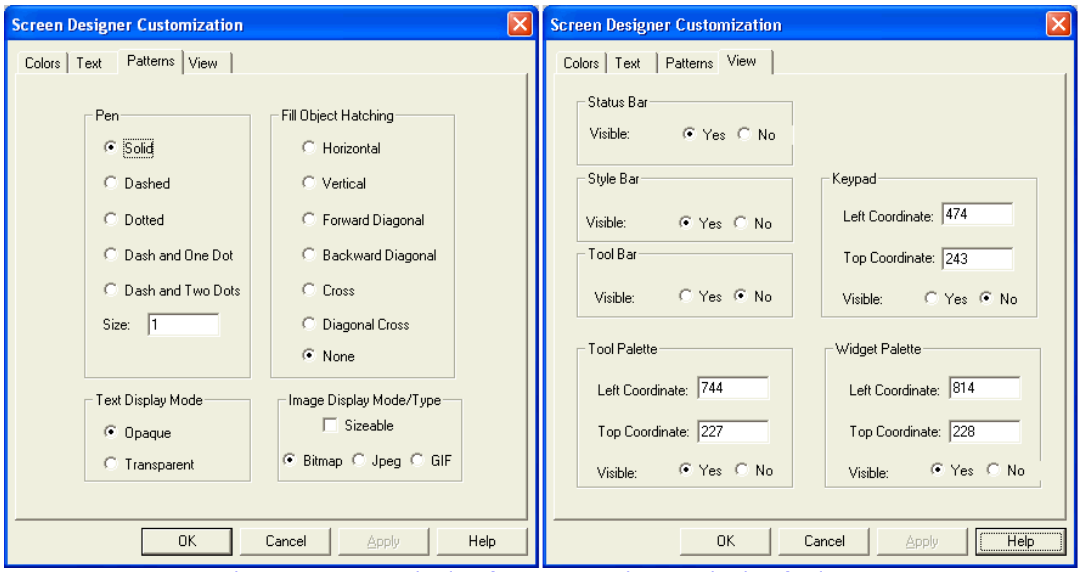


Figure 4-49: Customization → Patterns and Customization → View

The Customization → Patterns tab allows you to set the patterns for Pen (Solid, Dashed, Dotted, Dash and one Dot, or Dash and two Dots) and Fill Object Hatching (Horizontal, Vertical, Forward Diagonal, Backward Diagonal, Cross, Diagonal Cross, or None). The Customization → View tab allows you to set the visibility of Status Bar, Tool Bar, Style Bar, Tool Palette, Widget Palette and Keypad. In addition, it also displays the (editable) location of the Tool Palette, Widget Palette and the Keypad on the Screen Designer window.

4.9.3 Password Option

This command pops up a dialog box to set password and read/write access attributes for the current screen. You may enter any password in the combo list box provided, click on the Read and/or write access check box, and click on the Add button. Read access is required by the runtime to display data on the current screen. Write access is required for input data on screen to be written to PLC or other memory locations. You will see the list of passwords for the current screen in the list box. To review the current access privileges for a password, select it in the password list box and observe the Read/Write access check box. To delete a password, select it in the list box and click on the Delete button. Click on OK when you are finished with the password option.

Note: Screen passwords and read/write screen password protection is available for PC/PPC/CE runtimes.

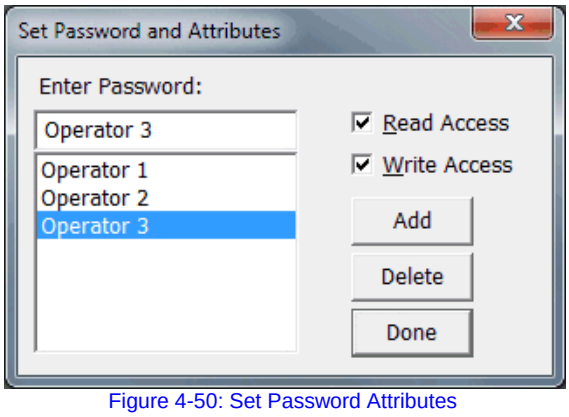


Figure 4-50: Set Password Attributes

4.10 Help

The Help menu offers the following commands to help you with the Screen Designer program.

Index	Shows an index to Screen Designer topics on which you can get help.
Using Help	Provides general instructions on using the Help system.
About Screen Designer	Displays the version number of Screen Designer application.

Index

Use this command to display the Screen Designer Help Index (Table of Contents). From the index of Help topics, you can select any desired topic to browse through the available information on-line.

You can click the Contents button in the Help window whenever you want to return to the Index (Table of Contents) of Help topics. You may also click on the Search button and look for help on topics of interest to you. **Note:** Another way to use online Help in Screen Designer is to press Shift + F1, which adds a question mark to the mouse pointer. Then click on menu item you need help on.

Using Help

Use this command for instructions about using Help. Screen Designer includes an elaborate on-line help system like the one available in many Windows application programs. If you are not familiar with this help system you may want to learn about using help. We suggest that you try and use the Help Index command as described above and return to Using Help command only if you find it necessary. This is because the Using Help command is not specific to Screen Designer but applies to the underlying Windows Help system in general.

You may run Screen Designer and Help in two windows; use the Screen Designer window to do your work after displaying the help on the topic you need in the Help window (in the Help window click on Options, keep help on Top).

There are many different ways you can use the Help System; experiment and find the way that suits the way you work.

About Screen Designer

Use this command to display the copyright notice and version number of your copy of Screen Designer.

4.11 Create Data Display Object

(The names Data Object, Active Object, Data Display Object and Active Display Object are interchangeable.) You may use one of two methods to create data display objects on screen:

Method 1: If widget palette is not displayed on screen, click on the Widget tool on the Tool Bar or click on the View → Widget Palette menu command. Select the widget tool on the screen by clicking on the widget palette. (Note that you will not be able to change one widget type to another by changing its properties.) Now click on the screen to display the selected widget object with its default properties. Double click on the widget object to see its Display Object Properties dialog box (discussed in detail below) and make any required changes.

Figure 4-51: Widget Palette

Method 2: Click on the Objects → Data Object menu choice. Now click on screen where you want to place a data object. You will be presented with Display Object Properties dialog box where you make the required selections. Note: Many dialogs ('Select Tag', 'Tag Manager', …) are resizable.

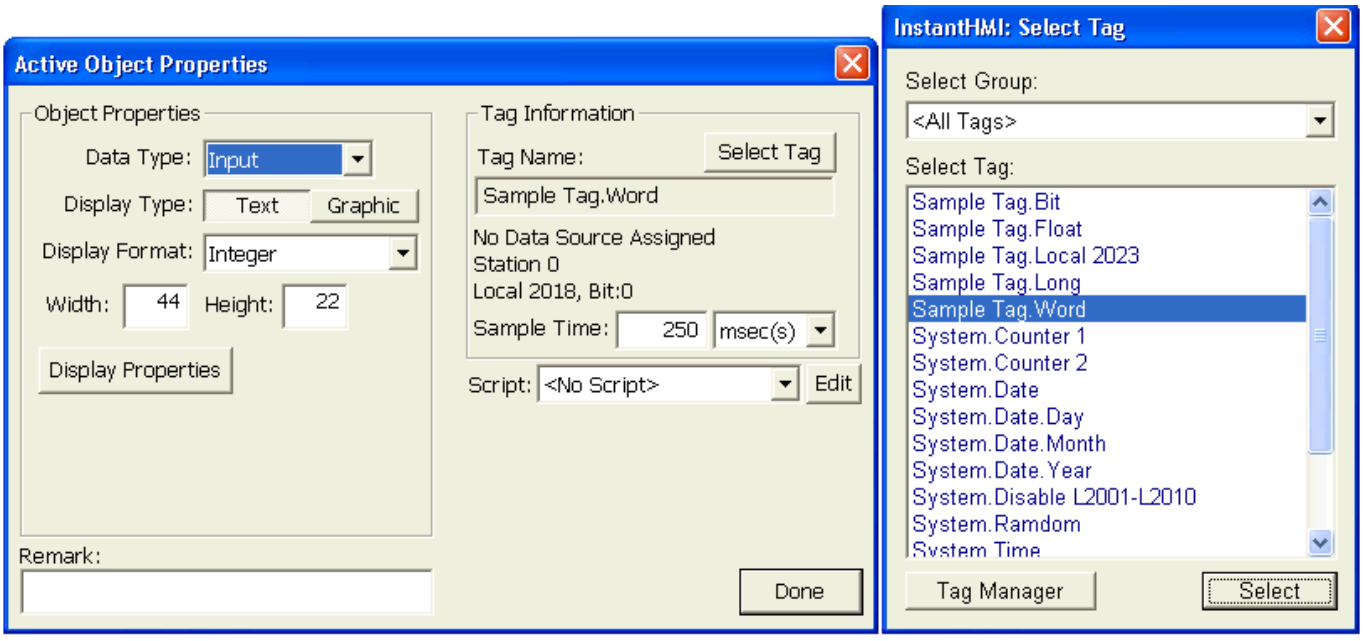


Figure 4-52: Creating a Screen Data Display Object

Think of the first method above as a shortcut to create the widget data objects on screen. With this view in mind, we shall discuss creating the data objects using only Method 2, with brief remarks regarding Method 1 where appropriate.

Only the display area of the screen and the system resource in your computer limit the number of data fields on a screen. The theoretical maximum number of fields is 65536. Only the system resources available in your computer, likewise, limit the number of screens. The theoretical maximum number of screens is 65536.
The data field will be tied to the PLC or other I/O device addresses when you select a Tag Name and data type, format, etc. as explained below. Screen Designer will display your data field on the screen using a string of #### indicating your choice of field width, font and color, or a widget with an appropriate bitmap. You should select color, font and alignment for the data field by using the corresponding options from the Active Object (Display Properties) dialog box. Note that if you select a field width which is too small for the data the run time engine will display ******* in the available field width instead of displaying truncated data or overflowing the display field. So you must select appropriate field width. To change field width or any other data specification select the data object for editing by double clicking on it. (Note that the customization option, Section 4.9.2, can be used to set Data Text font, Widget defaults etc).

To define a new data field using Method 2 (the Objects → Data Object menu choice), position the Cross Hair at the spot where you wish to display data and click the left button; Screen Designer will pop up the **Active Object Properties Dialog Box**. Here, you may select a Data Type from a pull-down list. Display Formats may be Text or Graphic as you specify with available display formats shown in a pull-down list. (Display Properties dialog allows you to enter the field width for the integral and decimal part of the data as well as alignment (justification). In addition, you may choose to have a border around the data field or not. There are Buttons you can click on to call up dialog boxes for Text color, Background color, and Font).

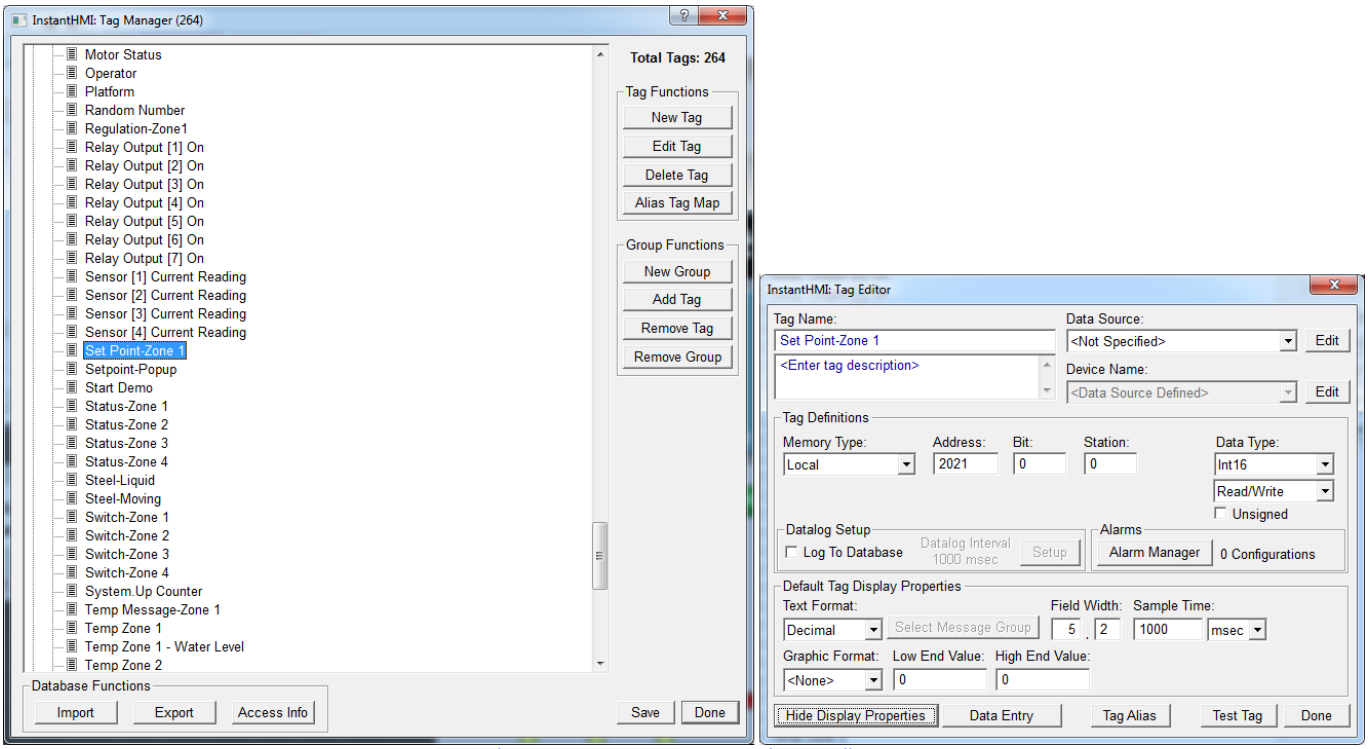


Figure 4-53: Tag Manager and Tag Editor

The **Select Tag** button allows you to associate a previously defined tag from the Tag database created and maintained using the Tag Manager. Click on the New Tag or Edit Tag button to invoke the **Tag Editor**. Here you may specify the tag Group Name, Tag Name, Tag Description etc. The Tag definition includes data Memory Type with a combo-list box showing the current selection. There are edit fields (similar to display Field Width) where you can enter numeric data (such as Station Number, Memory Address etc.) You can customize some of the names for the fields using

InstantHMI.INI file to suit your PLC naming conventions (see Section 9). Active items are shown in black and inactive items are shown in gray. Additional information (such as Bit number) may be shown but not used. When you click on an Edit Field such as Address that requires entering a number, the pointer changes to an I-beam. You may now use any of the usual Edit control keys (Arrows, Ins, Del, Bksp, Home, End, etc.) while entering your number.

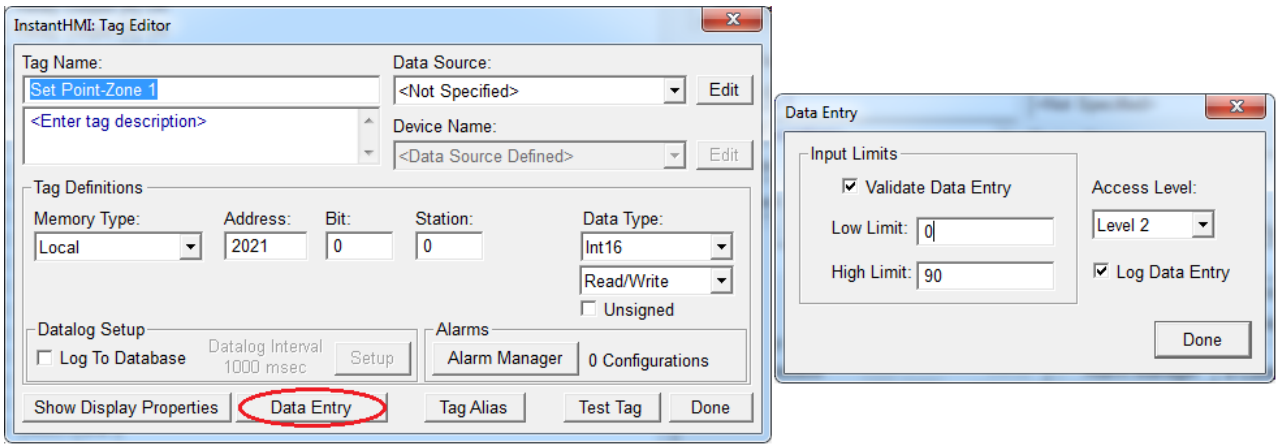
When the tag data specifications in the Tag Editor Dialog box meet your requirements, click the OK button. You will return to the design screen which shows appropriate indication (###, a raised box etc.) for your data field. To discard the tag data specification you have started, click the CANCEL button; you will be immediately returned to the design screen. The major elements in the Display Object and Tag Editor Dialog Boxes are discussed in the following sections.

4.11.1 Data Type

Each data field is assigned one of two categories (Text or Graphic) each of which can be one of three types: User Input, Monitor, Input/Monitor. The chosen data type is highlighted in the pull-down list combo box. Choose the type (User) **Input** if you wish to allow entry of data values into memory by the Operator while your application machine is running. Note that Data Type (User) Input should not be confused with discrete Input memory in Section 4.11.5. The (User) Input fields are initialized by reading (monitoring) the associated memory value just once at the start when InstantHMI runtime goes through its initialization. No further monitoring will take place and this field will reflect the last user input data through the screen.

User Input Authorization and Log of Tag Data Entries
(Runtime Version 6.1.30 and later)

Each Tag in the Tag Database is assigned a Tag Access Level. The default Access Level is 1 (monitor only and no data entry allowed). Levels 2-10 allow control of user inputs. Tags can also be setup to Log Data Entry input changes in a log file.



The User Manager is used to assign Tag Access Levels (1-10) to each user. Only users with access level equal to or exceeding the Access Level specified for a tag will be allowed Data Entry input to change the associated tag value. To log all such changes, check the 'Log Data Entry' for all tags of interest and enable the Runtime setup option parameter 'LOG_DATA_ENTRY = 1'.

Choose the type **Monitor** if you wish to just display a changing value on a screen for Operator Monitoring. Use data type **Input/Monitor** to define a data type to be both (User) Input and Monitor. Note that only monitor fields on a screen will be continuously monitored (at the specified Sample Time) and updated on screen by the Runtime. For faster screen updates you should keep the

number of monitored fields as small as possible and/or use as large a sample time as possible for less important fields.

InstantHMI provides a powerful feature called **OI-Widgets™**, which you can access when you choose the 'Graphic' display category**.** The OI-Widgets feature in Screen Designer is a metaphor that makes HMI screens analogous to "bolting and wiring together available gadgets into a control panel". To implement this metaphor the OI-Widgets are provided in a Palette form as shown earlier in Section 4.11. OI-Widgets are animated representations of common system monitor/control units like Gauges, Meters, Knobs, Buttons and LED's. Some sample widgets are shown in Figure 4-53).

These are fully scalable and movable. You have full control over the aesthetic features like colors, labels and text. OI-Widgets are included for both data entry (Knobs, Buttons, Spinners etc) and monitoring (Gauges, Meters, LED's, etc). OI-Widgets with 3-D features and eye-catching colors, enhance the look and feel of your application. They make common actions like increasing the value of a Register, updating Boolean fields and monitoring PLC data registers, easy. The operator does not even need a keyboard to enter data.

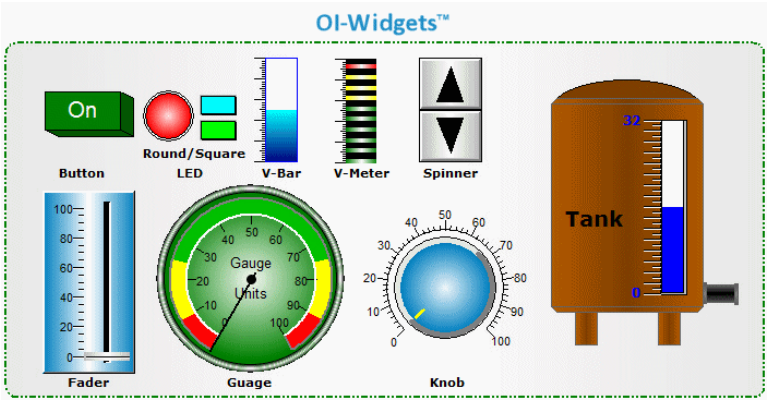


Figure 4-54: Sample OI-Widgets

The monitor widgets allow you to add several dynamic capabilities to your screens, based on changing data values in associated registers. These features, which are described further below, allow you to:

- Build shapes from boxes and circles whose colors can change in response to changing data values.
- Plot trends of up to four data items within a user defined plot box.
- Fill areas with different colors in response to changing data values.
- Create vertical and horizontal bars, meters, and gauges that respond on a percentage basis to changing data values.
- Display different bitmaps corresponding to different values in the memory address you specify. This feature can be used to create eye-catching animation. The sample demo provided with InstantHMI demonstrates this animation on the waste water screen (see Section 4.11.2).

Input Widgets include Button, Fader, Knob or Spinner (as discussed in Section 4.11.3). An input widget on the screen facilitates operator input of data values (analog or discrete) through the screen using only a mouse and no keyboard. **Monitor** Widgets include changing colored Box, Circle, Plot (Trend), Graphic Fill, Vertical Bar, Horizontal Bar, Gauge, LED, Vertical Meter and Horizontal Meter (as discussed in Section 4.11.5). **Input/Monitor** Widgets define a data type to be both input widget and monitor widget.

4.11.2 Text Data Format

Many different data formats are supported in InstantHMI, some formats are valid only for some of the data types (User Input, Monitor, Input/Monitor) as indicated by the entry 'Y' in tables below for Text / Graphic Data Display Categories.

Note: Most data text objects may be aligned (Left, Center, right) in their field.

Text Data Display Category			
Data Format	Input	Monitor	Input/ Monitor
Integer	Y	Y	Y
Long	Y	Y	Y
Boolean	Y	Y	Y
String	Y	Y	Y
Fixed	Y	Y	Y
Float	Y	Y	Y
Double	Y	Y	Y
BCD	Y	Y	Y
Binary	Y	Y	Y
Hex	Y	Y	Y
Long Fixed	Y	Y	Y
Message		Y	
Bitmap		Y	
Date		Y	
Time		Y	

The combo list box for Data Format lists only the valid data formats for the currently chosen Data Type and Data Display Category. A subset of the Graphic widgets has properties that you can change by clicking on the **Properties** button under Display Object Properties dialog. The current widget parameters will be described in the box titled **'Widget' Parameters.** Widget data formats are discussed in Sections 4.11.3 and 4.11.5.

Select **Integer** format if data in the field is to be an integer stored in a single (16 bit) register.

Select **Long** format if data in the field is to be a long integer stored in two consecutive (16 bit) registers. (Data will be stored with the least significant word at lower address).

Select **Boolean** format if data in the field relates to the boolean status of a bit with the only two values being 1 (for YES or ON) and 0 (for NO or OFF). For display purposes you may choose any pair of message text lines from a Message Group to represent the YES/NO or ON/OFF pairs. (Note that you may choose a pair of colors for the boolean display color values for bit box and bit circle as discussed in Sections 4.11.5.)
Select **String** format if the data is to be alpha-numeric. (This format is useful to store Alpha-numeric data in your PLC registers even if such a feature is not provided on your PLC.) In this case the field width can be up to 50 characters wide and the Type can be Input or Monitor. The string is stored in consecutive memory locations, two characters per location. Example: Assume that the data in an Alpha field of width eight is ABCD56GH and the address chosen by you for this field is Register 101. Here Register 101 will contain the first two characters AB, Register 102 will contain CD, Register 103 will contain the two characters 56 and the Register 104 will contain the last two characters GH.

Select **Fixed** format if you wish to treat the integer value in a single memory location as a fixed point number. For example, suppose you wish to have on your screen a fixed point field ###.## separated by a decimal point. Choose Fixed format and Register Memory, enter the register Address (say, address 101). You should then move to and select Field Width. Enter the width of the integral part, 3 in this example and then Fractional width, 2 in this example. InstantHMI at runtime will use (two consecutive bytes in) a single Register to store the fixed point number. Select **Long Fixed** format if you wish to treat the long integer value stored in two consecutive 16 bit memory words as a long fixed point number. The Long Fixed format works similar to the Fixed format.

Select **Float** if you desire the 32 bit IEEE floating point format for the data. Note that this representation requires 32 bits and hence two consecutive registers starting with the register address you specify will be used to store the floating point data. Select **Double** if you desire the 64 bit IEEE floating point format for the data. Note that this representation requires 64 bits and hence four consecutive registers starting with the register address you specify will be used to store the double precision value.

Select **BCD** format if data in the field is to be a Binary Coded Decimal. Note that, in this case, the highest value you can store in a 16-bit register is 9999. Note: BCD text object can be displayed in a fixed format if Fixed is selected as the Default Display Format in the tag.

Select **Binary** format if data in the field is to be represented as a string of sixteen zeros and ones.

Select **Hex** format if data in the field is to be represented as a string of four hex digits 0-9, A-F.

Select **Message** format if you wish to display an appropriate message from a Message Group. Note that "Message" format is valid only if you have chosen data type "Monitor".

You may create any number of message groups each containing any number of messages. The Tag associated with the message display object may refer to a 16-bit register / local memory or a single bit. At run time the integer value in the memory location associated with the tag will be used as the message number to display the corresponding text message from the selected message group (for example, Temperature Msgs as in the figure). The values associated with a bit are 0 and 1, which can support two text messages.

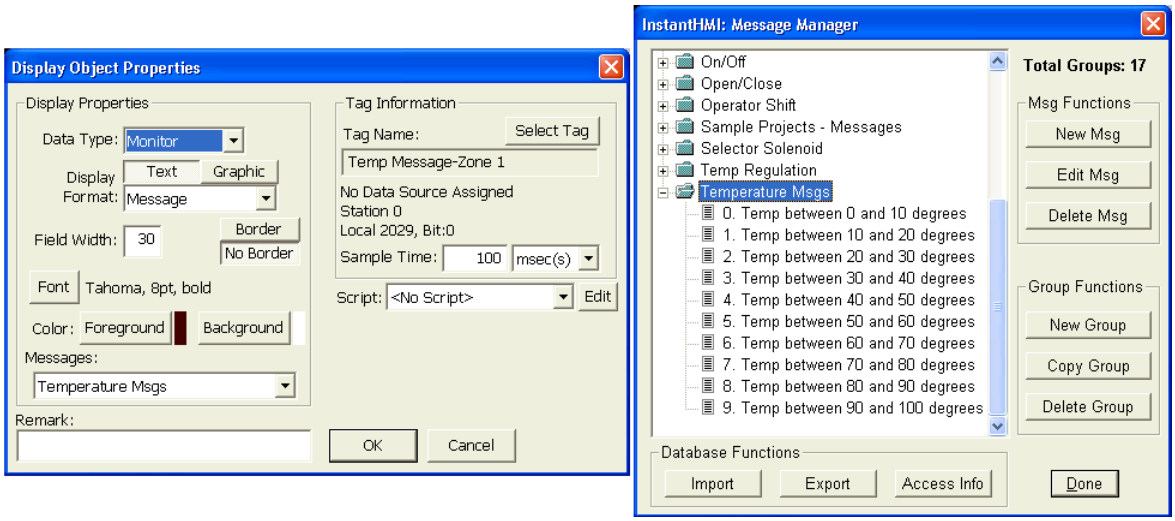


Figure 4-55: Creating a Message Display Object

We illustrate Register based Messages with an example. Suppose the Temperature Msgs message group contains 10 messages corresponding to the values 0, 1, …, 9. Each line represents a possible message to be displayed in a field (data type = Monitor, data format = Message, data Memory = Register, Field Width = 15, Address = 123, 'Message Group' = Temperature Msgs). At runtime, if register 123 has the value 2 in it, then text for line 2 in Temperature Msgs group ('Temp between 20 and 30 degrees') will be displayed. Note that the field width must be wide enough for the text of the longest message. The message text will have the color and size as designated for the data field.

Select **Date** format if you wish to display the Computer System date on your screen. Date format is valid only if you choose Data Type "Monitor". Note that Date format causes the runtime to constantly update the PLC registers (or Local Memory) you choose and also the data field on the screen. For faster screen updates, you should use Local Memory with Date format unless you wish to transfer computer system date information into your PLC registers. The system date will be read from the computer and stored in three consecutive PLC Registers or Local memory locations starting with the

address you specify for the field with Date format. The first location will contain the month MM, the second location will contain the date DD, and the third location will contain the year YYYY. Date will be displayed on screen in the format MM/DD/YY. You should allow for a field width of 8 or more for date display (Screen Designer defaults to a width of 10 to accommodate the default Date format MM/DD/YYYY). You may include date fields on multiple screens; make sure to use the same addresses. Only the addresses for the date field on the current screen will be used to update the memory addresses you specify.

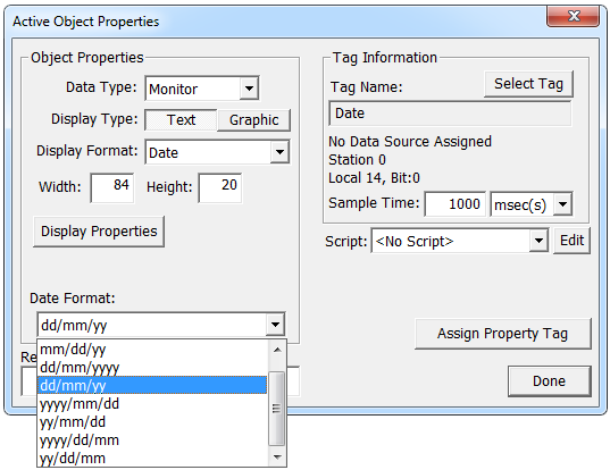


Figure 4-56: Date Display Formats

Note: You may choose among several Date Display formats as shown. Setup Date format in Screen Designer (as shown) or LaunchPad through Runtime Option (Section 9.4). Selected Date format will appear in Date field, Alarm Viewer, Alarm History, etc.

Select **Time** format if you wish to display the Computer System Time on your screen. The Time format is valid only if you choose Data Type "Monitor". Note that Time format causes the runtime to constantly update the PLC registers (or Local Memory) you choose and also the changing fields on the screen. For faster screen updates, you should use Local Memory with Time format unless you wish to transfer computer system time information into your PLC registers. The system time will be read from the Computer and stored in three consecutive PLC Registers or Local memory locations starting with the address you specify for the field with Time format. The first location will contain the hour HH, the second location will contain the minutes MM, and the third location will contain the seconds SS. Time will be displayed in the format HH:MM:SS. You may include time fields on multiple screens; make sure to use the same addresses. Only the addresses for the time field on the current screen will be used to update the Memory addresses you specify.

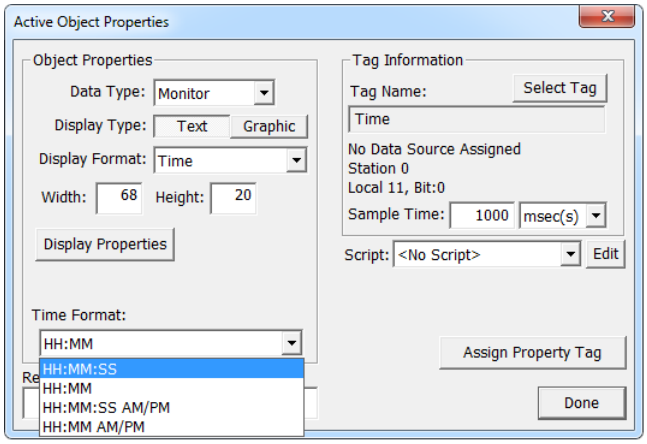


Figure 4-57: Time Display Formats

Note: You may choose among several Time Display formats as shown. Setup Time format in Screen Designer (as shown) or LaunchPad through Runtime Option (Section 9.4). Selected Time format will appear in Time field, Alarm Viewer, Alarm History, etc.

4.11.3 Graphic Data Format - Input Widgets

The input widgets allow the operator input of analog and discrete values using a mouse and no keyboard input. When you select Graphic display category and data type Input, you have a choice of the input widgets shown in the table below:

Graphic Data Display Category				
Widget	Data Format	Input	Monitor	Input/ Monitor
	Button	Y		Y
	Fader	Y		Y
	Spinner	Y		Y
	Knob	Y		Y
	Radio Button	Y		Y
	Check Box	Y		Y
	Combo Box	Y		Y

Select **Button** to place a button on screen that the operator can toggle between two states, On and Off. Double click on the Button to see its display object properties (Input/Monitor, Graphic Button, …). Click on 'Properties …' to see the dialog box for Button Properties. Here you may select one of three button types: Widget Button, or Windows Button, or Bitmap Button.

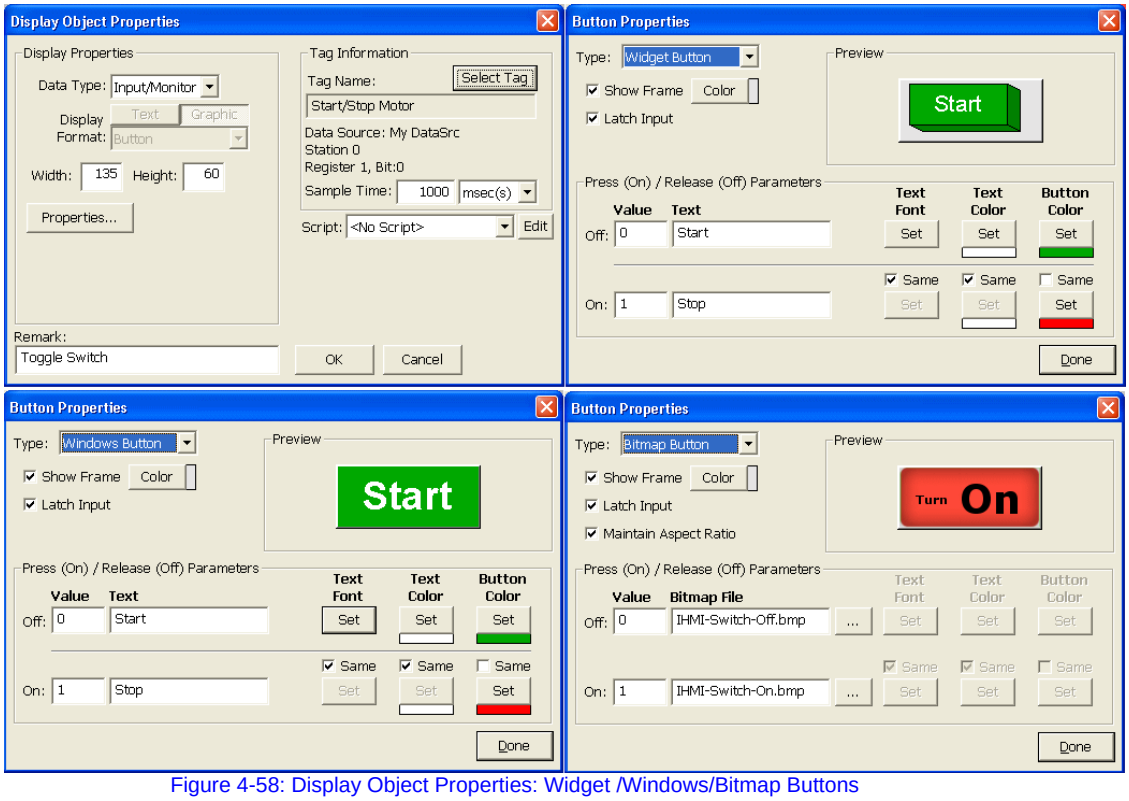


Figure 4-58: Display Object Properties: Widget /Windows/Bitmap Buttons

You may also create a Button by using the Widgets palette. Click on the Button Widget, note that the cursor changes shape to a button cursor, move to the desired location on screen and click. You get the default button on screen and the cursor changes to a Select Tool cursor. Double click on the button and change any button properties.

Widget Button Properties

For the Off state enter the tag value (example, 0) and label text (example, Start). Note that we have chosen to label the button with the action to take: (push to) Start. For the On state enter the tag value (example, 1) and label text (example, Stop). You also have complete control of the text font, text color, and button color for both the On and Off states. By default, the text font and color for the On state are the same as those for the Off state. Choose the label, font and colors to suit your application. You may also choose the to show the button frame and its color. Finally, you may select the button to stay latched in the On/Off state or return to its state after a momentary transition to the On or Off state. Click on the button in the preview panel to verify desired functionality. (Button height and width are better adjusted visually on screen.) Note that you can tie a button to a bit memory (up and down values must be 0 or 1) or register memory (up and down values may be any numbers). Click on Done button to change the button parameters or Cancel (**X**) button to retain the old parameters and return to the data specification dialog box.

Windows Button Properties

The Windows (style) Button is very similar to Widget Button in terms of its properties except for the frame thickness and 3D-height of the button.

Bitmap Button Properties

For the Off state enter the tag value (example, 0) and select a bitmap file to represent the way the button appears on screen in the Off state. For the On state enter the tag value (example, 1) and select a bitmap file to represent the way the button appears on screen in the On state. You may also choose the to show the button frame and its color. Finally, you may select the button to stay latched in the On/Off state or return to its state after a momentary transition to the On or Off state. Click on the button in the preview panel to verify desired functionality. (Button height and width are better adjusted visually on screen. The on/off bitmap will be re-sized so as to fit the button size). Note that you can tie a button to a bit memory (up and down values must be 0 or 1) or register memory (up

and down values may be any numbers). Click on Done button to change the button parameters or Cancel (**X**) button to retain the old parameters and return to the data specification dialog box.

Select **Fader** to place a fader/slider on the screen. The Fader is functionally equivalent to the Windows scroll bar. The operator can enter any integer values by dragging the slide on the fader up or down. If you double click on the fader, the Data display object specs dialog is brought up. Click on properties and you will see the following Fader Properties dialog (Figure 4-58). Enter the Limits (values for Min Limit and Max Limit), and the tick color, major ticks, and minor ticks for label spacing. Select fader Fill Properties (Gradient or Flat Fill and 'Slider' color) as desired. Select Border Style (Rectangular or None). Click on Done button to change the fader parameters or **X** 'Cancel' button to retain the old parameters and return to the Display Object Properties dialog box. Click on Fader preview to test the slide operation at runtime.

You may also create a Fader by using the Widgets palette. Click on the Fader Widget, note that the cursor changes shape to a fader cursor, move to the desired location on screen and click. You get the default fader on screen and the cursor changes to a Select Tool cursor. Double click on the fader and change any fader properties.

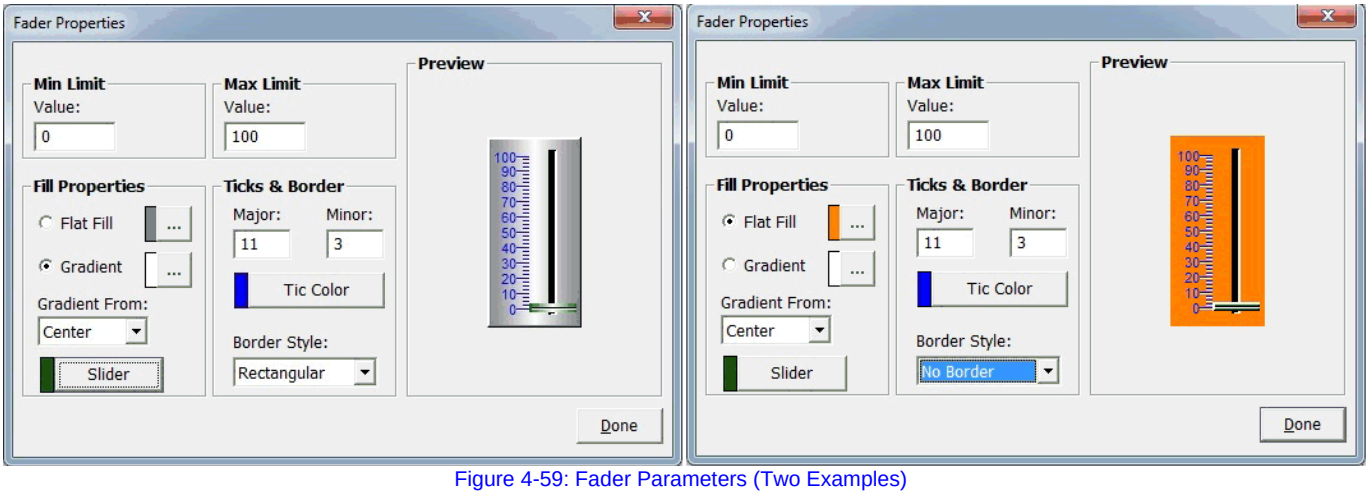


Figure 4-59: Fader Parameters (Two Examples)

Select **Knob** to place a knob on the screen. The operator can enter any integer values by clicking on the knob setting desired. If you double click on the Knob, the Display Object Properties dialog box appears. Click on Properties and you will see the following dialog box for Knob Properties.

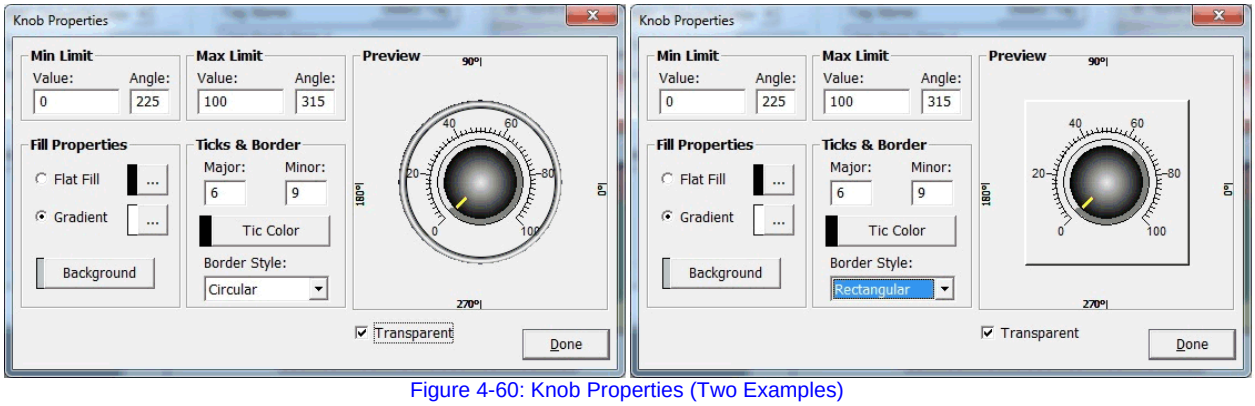


Figure 4-60: Knob Properties (Two Examples)

Enter the Limits (Min and Max data values and the corresponding Angle for knob positions). Note that angles are measured anti-clockwise with the horizontal line (left to right) as the zero reference so that 90^0 will point to top of the screen and 270^0 will point to bottom of the screen, etc. Select Knob 'Fill Properties' (Flat Fill or Gradient Fill, and Background Color). Select 'Tick & Border' Properties as desired. Select Border Style (Circular, or Rectangular with/without Border); choose if border is to be transparent (see through) and not opaque. If the preview shown is satisfactory, click

on Done button to change the knob parameters or **X** 'Cancel' button to retain the old parameters and return to the Display Object Properties dialog box.

You may also create a Knob by using the Widgets palette. Click on the knob Widget, note that the cursor changes shape to a knob cursor, move to the desired location on screen and click. You get the default knob on screen and the cursor changes to a Select Tool cursor. Double click on the knob and change any knob properties.

Select **Spinner** to place on your screen a thumb wheel spinner which the operator can click on to increment or decrement the integer value in the associated memory address. If you double click on the Spinner, the Display Object Properties dialog box pops up. Click on Properties and you will see the Spinner Parameters dialog box. Enter the spinner high end and low end data values, and the increment/decrement step value to use when you click on the up/down arrow of the spinner. (As shown in the examples, you may have various looks for your spinner by selecting different Background and Arrow colors and presence/absence of border.) Click on Done button to change the spinner parameters or **X** 'Cancel' button to retain the old parameters and return to the Display Object Properties dialog box.

You may also create a Spinner by using the Widgets palette. Click on the Spinner Widget, note that the cursor changes shape to a spinner cursor, move to the desired location on screen and click. You get the default spinner on screen and the cursor changes to a Select Tool cursor. Double click on the spinner and change any spinner parameters.

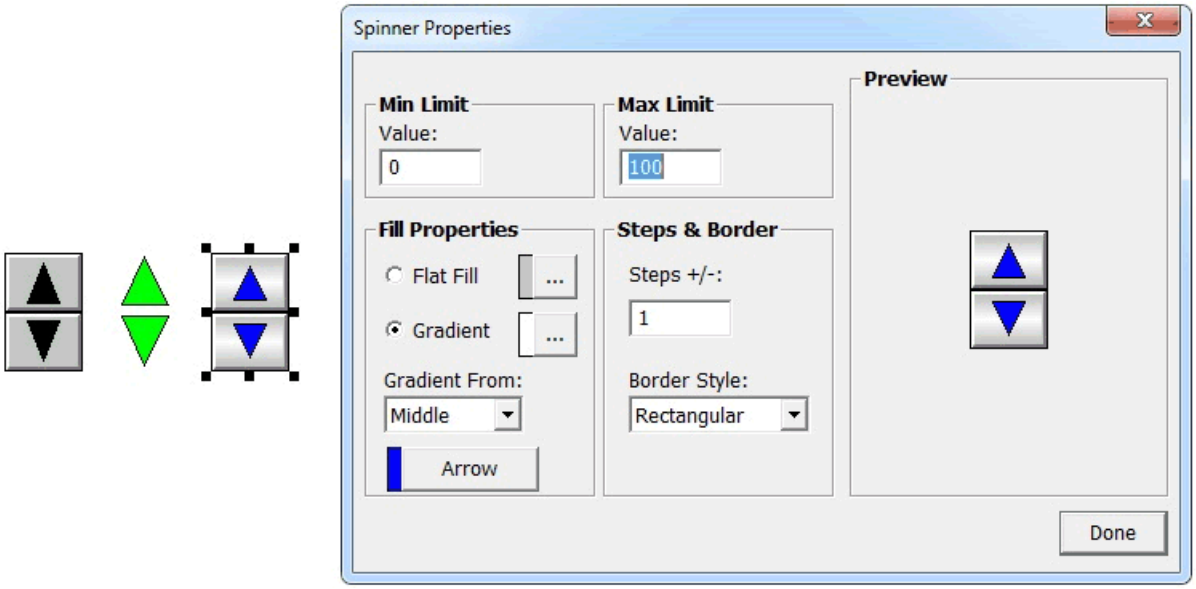


Figure 4-61: Spinner Examples and Spinner Parameters

The input widgets (Button, Fader, Knob and Spinner) may also be used as Input/Monitor Widgets. In this case the Buttons, Faders and Knobs on the screen will show the correct value of the memory location attached to them. Of course, all input widgets will display the information correctly as of their last use on that screen.

The graphic input widgets 'Combo Box, Check Box, and Radio Button ' are included in the Clipboard Tools discussed in Section 4.11.4.

4.11.4 Clipboard Tools

	Static Text	

	Text Box	
	Radio Button	
	Pull-Down List	
	Check Box	
	Macro Button	

Figure 4-62: Clipboard Tools

Usually, HMI software screens include input and/or monitor fields that are tied to data sources, which in turn derive their data values from memory locations in controllers. However, when the purpose is manual data entry by the operator, it maybe unnecessary to burden the controller program logic and memory for this purpose. InstantHMI Screen Designer includes various screen elements that are amenable to manual data entry by the operator. These elements are grouped together under the heading 'Clipboard Tools' and can be used to build a Clipboard for use by the operator (see Figure above). The clipboard tools are as follows:

Static Text tool (Section 4.6.1, Objects → Static Objects → Text) is used to enter descriptive text on the screen. It is repeated as part of clipboard palette for convenience.

The **Text Box** allows the operator entry of Ascii text and is obtained from the standard Text Display object (Section 4.11.2) with data format = String.

Select **Pull-Down List** to place a pull-down list of options on the screen. The Pull-Down List is functionally equivalent to the Windows combo-box. The operator can enter any one of text messages displayed when the pull-down list arrow is clicked. The text messages would be included in a message group (Operator Names, in the figure) associated with the pull-down list as shown in the Display Object Properties dialog box.

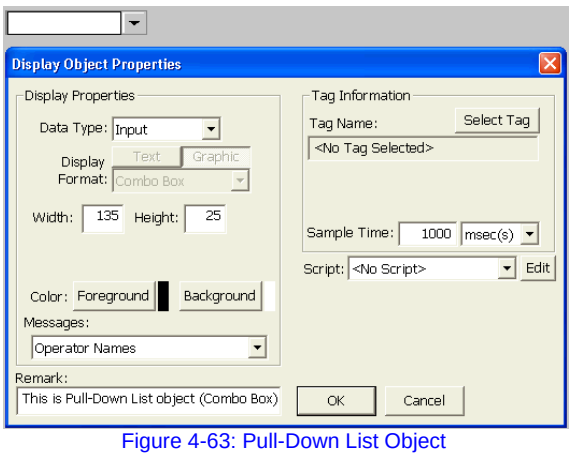


Figure 4-63: Pull-Down List Object

Select **Macro Button** to place a macro button on the screen. The macro button is functionally equivalent to the Windows button control. Note that the Macro Button properties dialog box allows you to place a Label text in your choice of colors and Font, attach a macro key to the button and/or induce a 'Switch To Selected Screen' functionality. Only the portion of the Label Text that will fit the available button area will be displayed. You may have multiple lines of text (text wrapping happens

automatically) if the button height can accommodate them as shown in the button examples in the figure. (Compare the Macro Button to the graphic input Button widget discussed in Section 4.11.3).

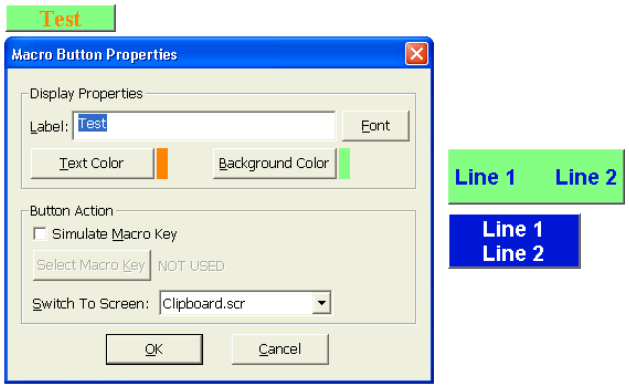


Figure 4-64: Macro Button Object

Select **Check List** to place one or more check boxes on the screen. You will be prompted for the number of check box controls you want on the screen. The check box is functionally equivalent to the Windows check-box control. Note that the check box display object properties dialog box allows you to place a Label text in your choice of colors. The Check Box Properties dialog box allows you to change the text label and its font. In addition, you may position the check mark on the right or left of the label text and assign the checked and unchecked values to be associated with the check box control. The meaning of the checked/unchecked values is as follows: Assume the box is unchecked to start with. When the tag associated with the check box control exceeds the 'checked value' a check mark appears in this field. If subsequently (after being checked) the tag value falls below the un-checked value, the control will be un-checked. You may select the checked and un-checked values to be the same. Then the control will be checked when the tag value exceeds the common trigger value, otherwise it will be unchecked.

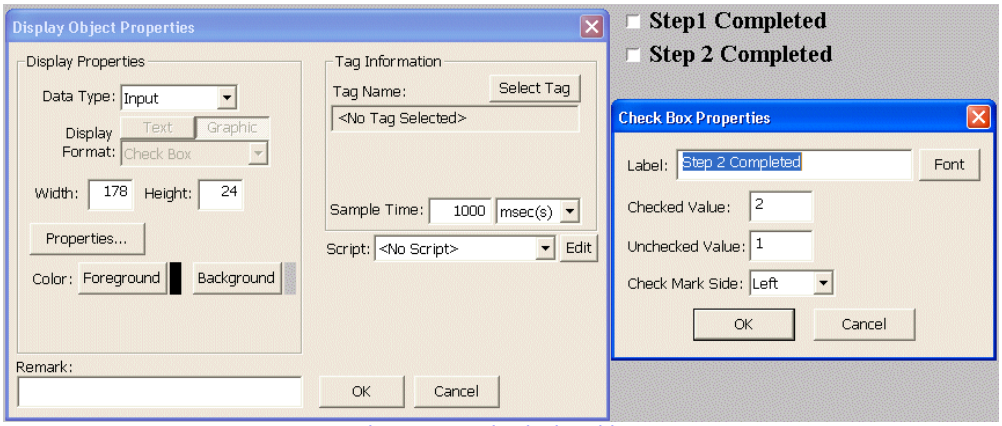


Figure 4-65: Check List Object

Select **Radio Button** to place one or more radio buttons on the screen. You will be prompted for the number of radio button controls you want on the screen. The radio button is functionally equivalent to the Windows radio button control. Note that the radio button display object properties dialog box allows you to place a Label text in your choice of colors.

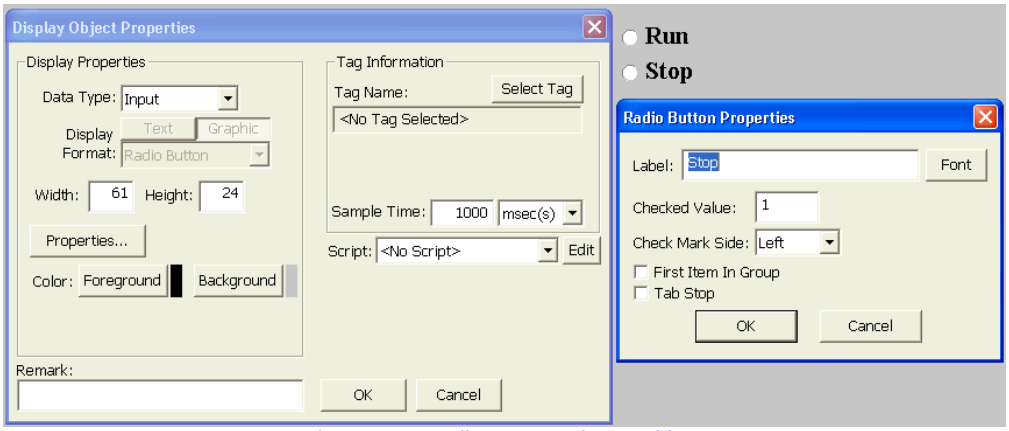
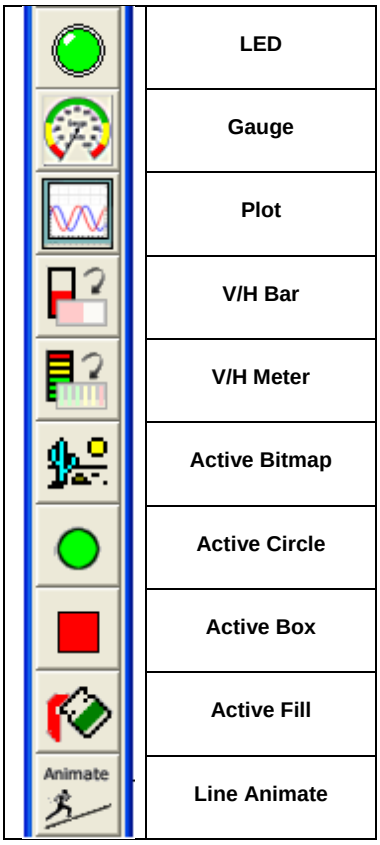


Figure 4-66: Radio Button Selector Object

The Radio Button Properties dialog box allows you to change the text label and its font. In addition, you may position the Bullet mark on the right or left of the label text and assign the checked values to be associated with the selected radio Button control. You must select the checked values for the different radio buttons in a group to be distinct. Then one of the radio control buttons will be checked when the tag value matches the enumerated trigger value, otherwise it will be unchecked. Note that this allows for the possibility that none of the radio buttons will be checked (when the tag value is none of the enumerated values).

4.11.5 Graphic Data Format - Monitor Widgets

The monitor widgets allow the operator to monitor the discrete and analog values. When you select Graphic display category and data type Monitor you have a choice of the monitor widgets shown in the table.



LED
Gauge
Plot
V/H Bar
V/H Meter
Active Bitmap
Active Circle
Active Box
Active Fill
Line Animate

The abbreviation V stands for Vertical, and H stands for Horizontal. The input widgets in Section 4.11.3 can also act as monitor widgets if you invoke the Input/Monitor data format.

Select **LED** to place an indicator light on the screen. Associated with the LED are two states 'Off' and 'On, and corresponding trigger values (Trigger-Off and Trigger-On).

- The LED is in its Off state when the associated tag value <= 'Trigger-Off'
- The LED is in its On state when the associated tag value >= 'Trigger-On'

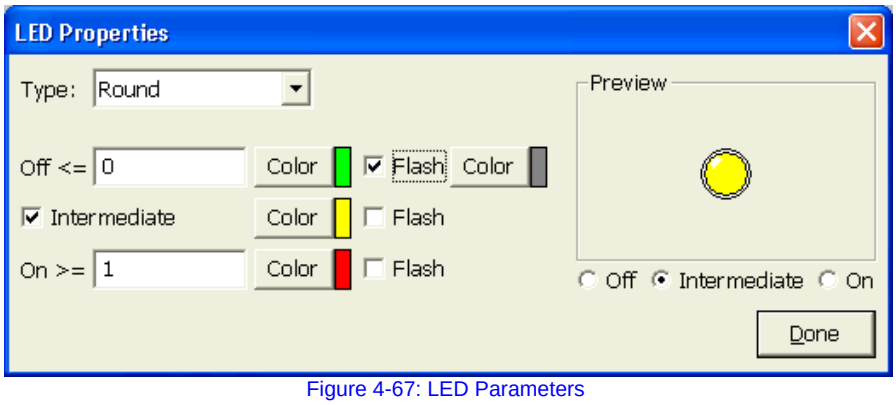


Figure 4-67: LED Parameters

A third 'Intermediate' state may also be defined to represent the intermediate values during transition from On to Off (or vice versa).

Note: When the associated tag takes on only two discrete values (0 and 1, for example), the intermediate is the state during transition from 0 to 1 (or vice versa).

Entering the trigger values for Off and On states and define 'Colors' for the LED indicator in each of its states. In addition, you may also include a 'Flash' attribute for any LED state(s). The Flash attribute makes the LED alternate (flash) between its OFF state color and the flash color. Use the preview panel radio buttons to simulate the LED behavior in each of the defined states. Click on Done button to change the LED parameters or the **X** (Cancel) button to retain the old parameters and return to the display object properties dialog box.

You may choose to create animated V/H Bar, V/H Meter and Plot. You have complete freedom in creating a "frame" around these objects including shading, hash marks and other annotation. You add your annotation making sure to stay outside the active area covered by the plots, bars, or meters. Samples showing Plot, Bar, etc. objects are included in the Demo project.

Select **Gauge** to have a dynamic needle moving in a circular arc enclosed in a box or circle on the screen. You will see the following dialog box for Gauge Properties.

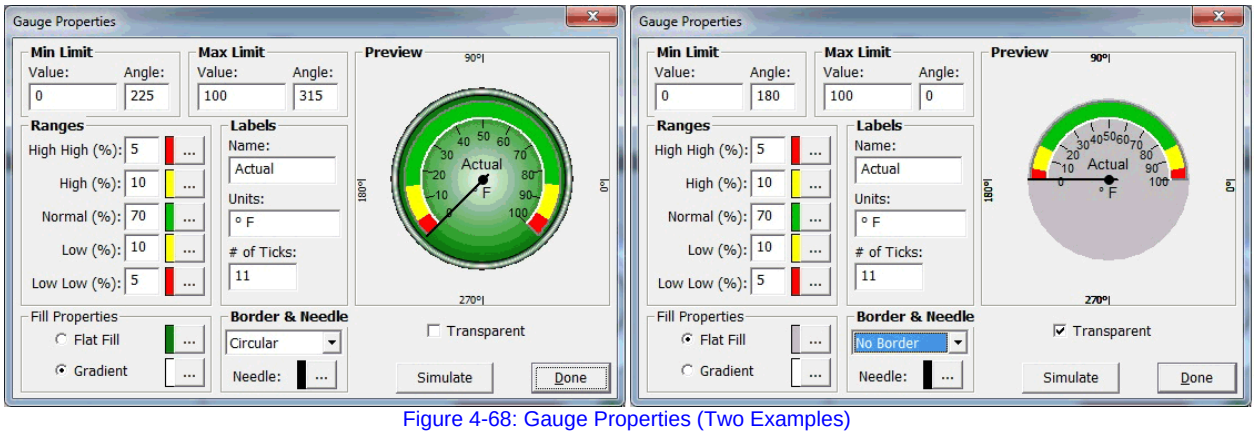


Figure 4-68: Gauge Properties (Two Examples)

Enter the data values for the Limits (Max value, Min value and corresponding angles for the needle) and Labels (Name, Units, and # of ticks with a label). Note that the needle angle is in degrees anti-clockwise with respect to a right horizontal zero reference. By selecting the colors and % ranges

(for High High, High, Normal, Low and Low Low ranges) you can customize the gauge to meet your requirements. Two examples are shown in Figure 4-67. Click on Done button to change the gauge parameters or **X** (Cancel) button to retain the old properties and return to the Display Object Properties dialog box. This dialog shows the Gauge in its pre-view panel; click on Simulate button to pre-view gauge as it will appear at runtime.

Select **Plot** to include a Real/Historic Trend Plot on your screen (Section 4.6.8).

Select **V/H Bar** to have a dynamic vertical/horizontal bar on screen. Click on Properties button to access the Bar Properties dialog. The Limits (high value and low value) you enter along with the value in the register (whose address you specify in the tag definition) will determine the % size of the vertical/horizontal bar seen by the operator.

You may also choose a rounded corner with horizontal (H-Radius) and vertical (V-Radius). The bar Orientation angle may also be specified to rotate the bar as desired. You may also choose to fill the interior of the bar. Select Flat Fill to fill the interior with Color 1. If you desire a Gradient Fill, also select Color 2 and its position for the gradient effect. You may include a border and specify the border color. You may also select Background color (un-filled area of bar).

Click on the Simulate button to pre-view the runtime behavior of the bar as the register value changes between the low end value and high end value. Note that you may annotate outside the box you have selected for V/H Bar any way you choose using scale hash marks, division labels, etc. (Tip: Use the Bar with a Scale in an object assembly to construct your own custom Bar object).

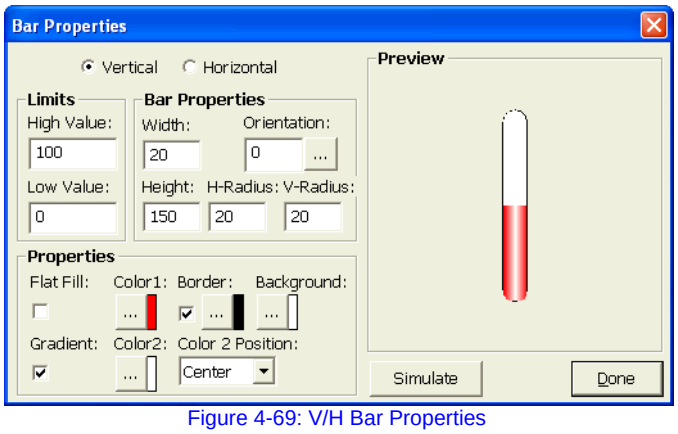


Figure 4-69: V/H Bar Properties

Select **V/H Meter** to place a vertical/horizontal meter on screen which lights up strips of three different colors you choose for the Low, Middle and High ends of the meter. Click on Properties button to access the Meter Properties dialog.

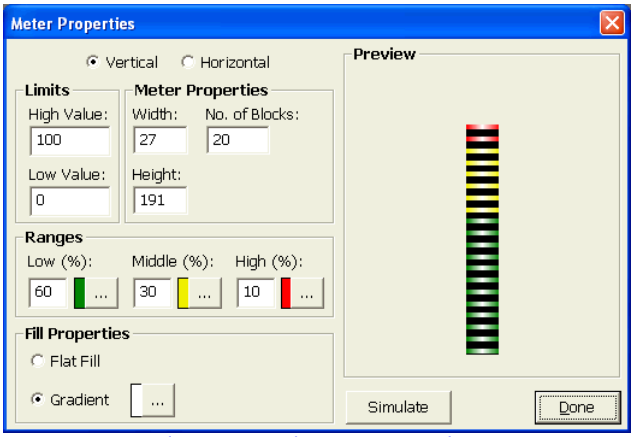


Figure 4-70: H/V Meter Properties

Enter the Limits (data values for the low end and high end), Ranges (low/middle/high adding up to100%) and the color for each of the range. The value in the register (whose address you must specify) will determine the % size of the vertical/horizontal meter lighted up for visualization by the operator. You may also enter the meter width, height, and the number of blocks (strips) of light in the meter. Select Flat/Gradient Fill for the range color blocks. Click on the Simulate button to pre-view the runtime behavior of the meter as the register value changes between the low end 0% value and high end 100% value. Note that you may annotate outside the box you have selected for V/H Meter any way you choose using scale hash marks, division labels, etc. (Tip: Use the Meter with a Scale in an object assembly to construct your own custom Bar object). Click on Done button to change the Meter parameters or Cancel button to retain the old parameters and return to the data specification dialog box.

Select **Image** if you wish to display (active) images (*.bmp, or *.jpg, or *.gif). Compare this with the (static) Image object discussed in Section 4.6.1. This option works like register and bit based message; instead of messages in your message group # you will now specify image file names in your image groups. The register or bit values will be used to select the image file name that will be displayed on screen. This feature can be used to produce nice animation effects (see InstantHMI Demo). Note: Transparency attribute may be set for active bitmaps (Section 4.6.1).

Select **Active Box/Circle** if you wish to include a box/circle (whose size you specify) on your screen and change its color dynamically. You have three choices:

- a (bit) box/circle whose On Color and Off Color you can specify. The color at runtime reflects the On (value 1) or Off (value 0) state of the bit you specify in a tag (e.g. Register or Local memory address and bit number).
- A (16 color) box/circle based on the integer value (0 - 15) in the associated tag (register or Local memory). Any register values higher than 15 will be reduced to the range 0-15 by using the remainder obtained after dividing the register value by 16. Note that the box/circle can be animated on the screen using sixteen colors you specify.
- A (24-bit color) box/circle based on the RGB value in the associated tag (long-integer stored in register or Local memory).

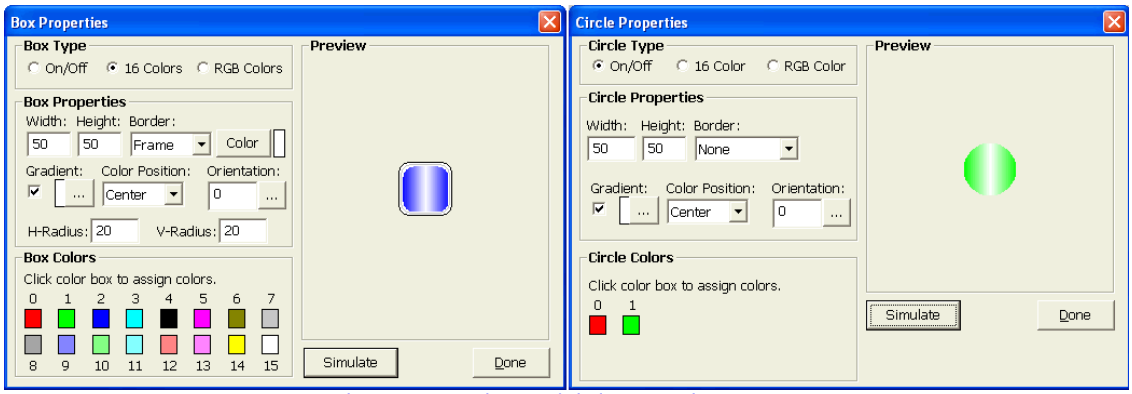


Figure 4-71: Active Box/Circle Properties

The rectangular border outline of the box will be drawn with Width, Height, Border style (Flat, Raised, Sunken or Framed) and Color selected. You may also choose a rounded corner with horizontal (H-Radius) and vertical (V-Radius). The box Orientation angle may also be specified to rotate the box as desired (See also discussion for Figure 4-18).

Select **Active Fill** to fill an area of screen starting from the dataspec location to a boundary color you specify. The color of the fill will be controlled dynamically by the tag value (bit 0-1, integer 0-15, or long 24-bit rgb value) at run time. You may use this Fill feature to fill any shape with a color you specify for the boundary. Note that if the boundary is not well defined (closed), you may get unexpected ('spill') results at run time. To guard against any potential problem, test using the Static Fill Option (see Section 4.6.1) from the main menu before using the Active Fill dataspec option. You have three choices:

- a (bit) fill whose On Color and Off Color you can specify. The color at runtime reflects the On (value 1) or Off (value 0) state of the bit you specify in a tag (e.g. Register or Local memory address and bit number).
- A (16 color) fill based on the integer value (0 - 15) in the associated tag (register or Local memory). Any register values higher than 15 will be reduced to the range 0-15 by using the remainder obtained after dividing the register value by 16. Note that the circle can be animated on the screen using sixteen colors you specify.
- A (24-bit color) fill based on the rgb value in the associated tag (long-integer stored in register or Local memory).

Select **Line Animate** to create a powerful monitor widget using any object from the Object Assembly library. The concept of line animation is as follows. You specify graphically any straight line on the screen. This line is defaulted to be a short horizontal line, which you could reposition, stretch or shrink as desired. The line itself will be invisible at runtime. Its purpose is to serve as a reference animation path for the object assembly you have selected. The point of reference will move along this line based on the value in the associated memory location (register or local defined by the associated tag name). You may specify the Start/End Data Value corresponding to the Start/End of the line.

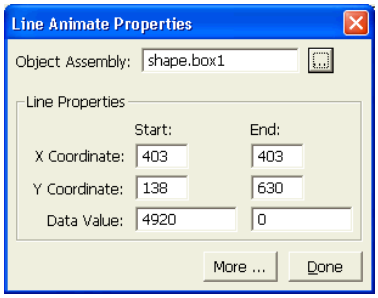


Figure 4-72: Animated Line Object

You may click **Done** button at this point and get the "single segment, single object" line animation. If you click on the **More** button you will have access to additional parameters for the animation. (If the animated line segment dialog covers your animated line on the screen, move the dialog box so your animated line is visible).

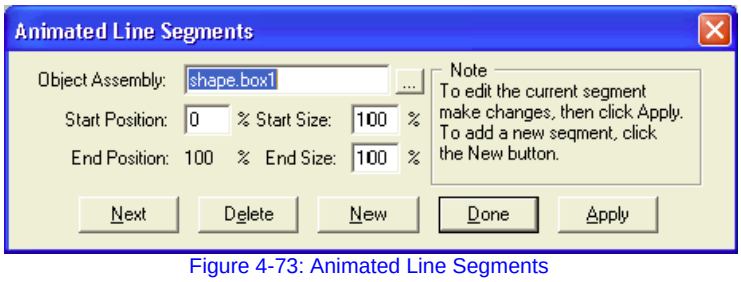


Figure 4-73: Animated Line Segments

You may then enter the Start size and End size of the object assembly as it travels from Start to End of the line. The size will be varied proportionally between the Start and End size as the object travels the length of the line. Once you specify all the parameters for the current animation click on **Apply** button. You may now repeat the above process to introduce a line segment or click on **Done** button.

To review your specification click on the **Next** button to cycle through the animation line segments. Click on the **Delete** button to delete the Segment under review. Click on the **Done** button when you are finished. Note: you can assign visibility property to a line animate object.

4.11.6 Color and Font

Screen Designer Display Object Properties dialog provides buttons for **Foreground** and **Background** colors. Click on these buttons to specify the colors for the data field (see also Section 4.7.2). Click on the **Font** button to specify the font for the data field.

4.11.7 Sample Time

The **Sample Time** for each display object data field defaults to the Monitor Sample Time defined for the associated Tag. You may change the Sample Time for the display object. InstantHMI runtime interface provides a mechanism to update the data field (by sampling the associated data memory) at the sample time you specify. A smaller sample time means that this field will be checked most frequently; a higher sample time means that the field will be sampled less frequently. Select the units msec(s), sec(s), min(s), or hour(s) for sample time. Note that in addition to monitor sample time, InstantHMI Tag Editor also allows an Alarm Sample Time as well as a Datalog Interval to be defined for each tag.

4.11.8 Script

You can create and edit Scripts from within **Screen Designer**. First create a monitor data item to which you wish to attach a Script. Double-Click on the new data object. The Data Display Object dialog will appear. Select a Script from the pull-down list (if it exists). Click on the Edit button for viewing/editing selected script or to create a new script. A dialog entitled “Select Script File” will appear. Click on the Create Script File check box and enter a new script name. Click OK. The Script field will display the script you selected or created. (See Section 7 for details on how to create scripts).

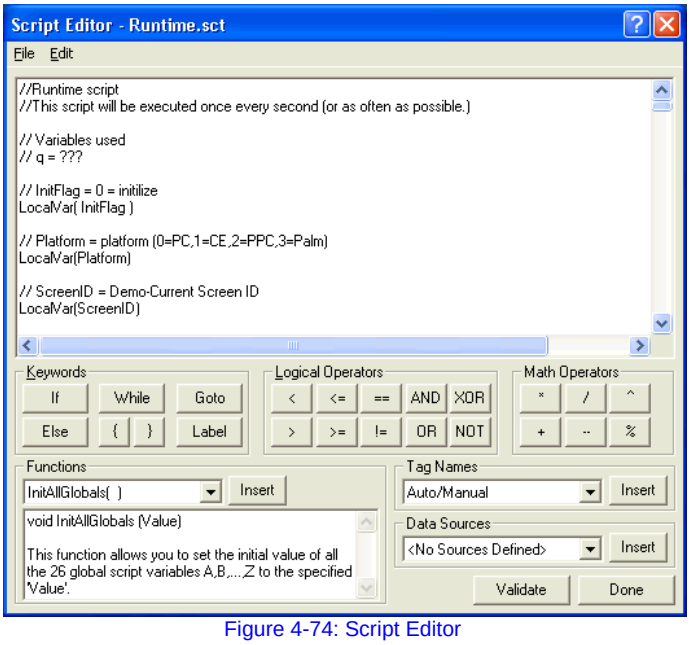


Figure 4-74: Script Editor

4.11.9 Remark

In the Remark field you may enter a description of the data field or other notes. Note that these remarks are for your convenience in documentation.

4.11.10 OK and Cancel

After completing the display object data specification review the dialog box entries and click OK to accept your specification for the data field. If you change your mind about creating the new data field click on Cancel button. You will return to the design screen.

4.12 Create Pop-Up Display Window

Starting with version 6.x, most objects (Static as well as Data) may be assigned **Attribute Tags**, which control the 'Visibility' of the object on screen. The attribute tag enables designing 'pop-up' windows (mini-screens) as part of the screens you design. (Pop-up windows may be useful to display a PID-face plate when desired on a DCS process monitoring screen.) Note: Bitmaps or other static objects are allowed to be on top of any active objects.

All objects (Static and Active) can have visibility property. All objects have an 'anchor point and bounding rectangle (on screen)'. This bounding rectangle is opaque (when the object has visibility enabled) and hence none of the objects overlaid by the 'bounding rectangle' of the visible (pop-up) object will show through the pop-up window (that is, bounding rectangle). Idea: You may build-in an 'X' (top right of the bounding rectangle) with same Visibility Tag to 'close' the pop-up window. Note: Trend object will not be allowed to popup in a multi monitor setup (Version 6.1.32 Build 4003, to avoid a problem when the same screen is shown in both monitors and a trend is in the visible popup state).

Pop-Up Window Example

We build a simple screen with a pop-up window consisting of a group of objects. Such a group may be built as an Object Assembly if desired. Our example pop-up includes static objects (Text, Box) and active objects (Button, LED). We assign an Attribute Tag (Local 1) to each of the objects in the pop-up; this may be done by assigning the attribute tag to the object assembly including all the objects in the pop-up. The objects in the pop-up window will pop-up in the designated location when the assigned attribute tag has a value 1 as set by the Pop-Up button provided on the screen. Other objects on the screen are unaffected. There may be more than one pop-up window on the screen.

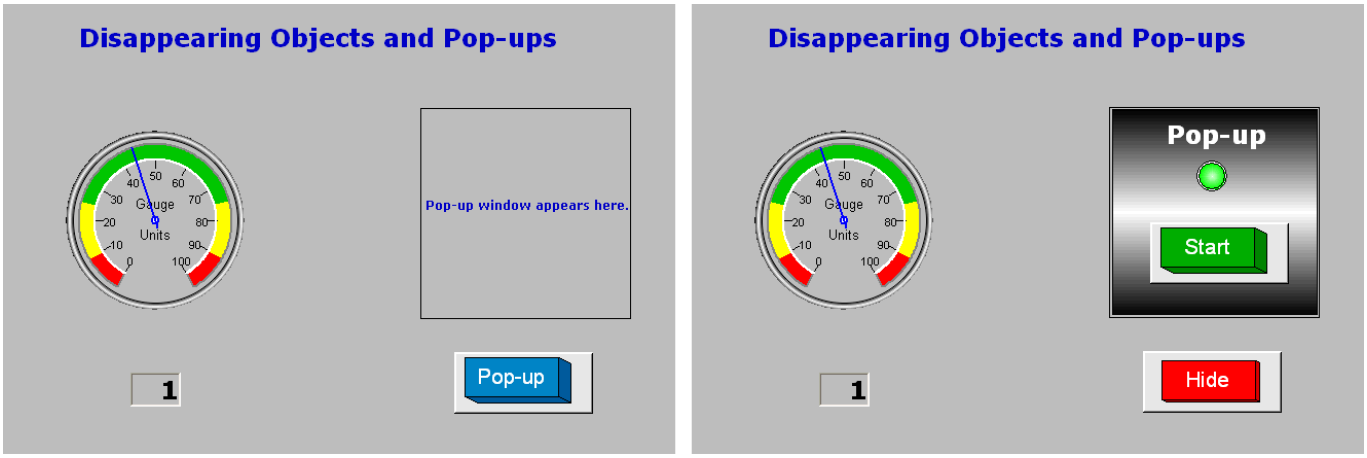


Figure 4-75: Pop-Up Window example

Step 1: Design Screen objects as usual

Our example screen includes a Gauge and a data object field (left of the screen). For illustration, we have drawn a box and a text string 'Pop-up window appears here.' We have a button object labeled 'Pop-up' with the properties shown below.

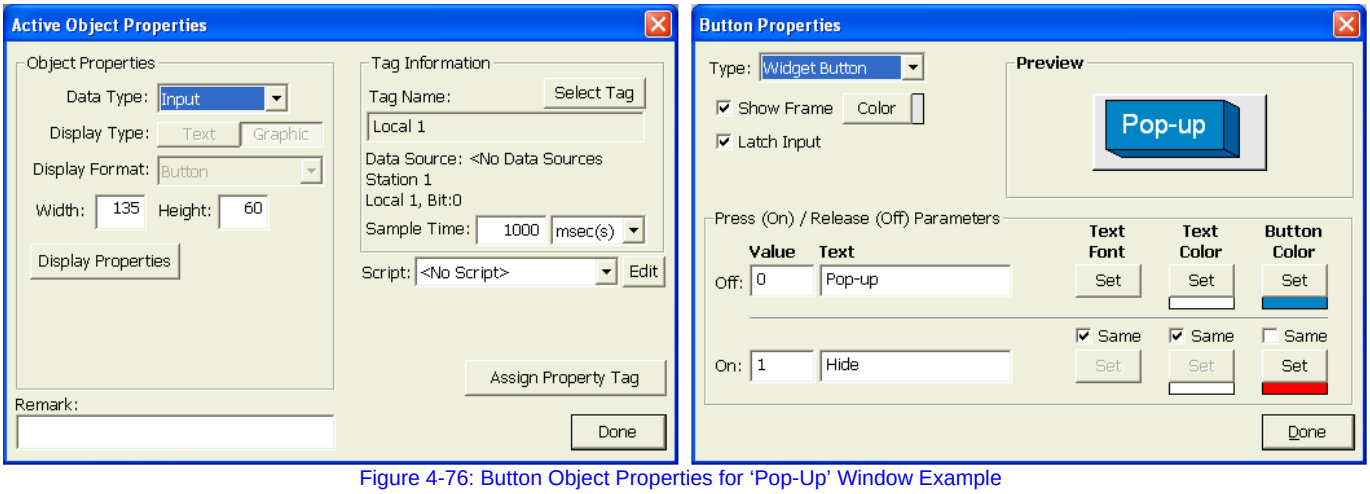


Figure 4-76: Button Object Properties for 'Pop-Up' Window Example

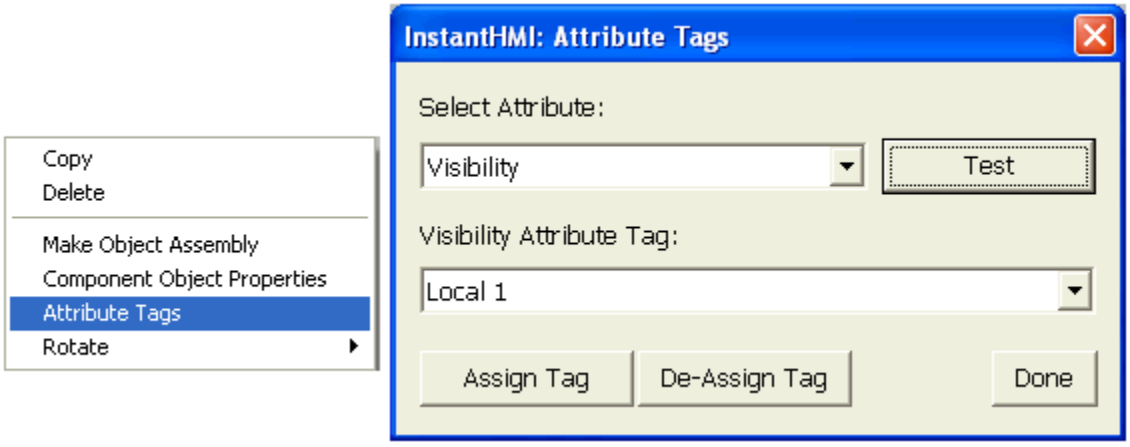
Note that in the Off-State the button label says 'Pop-up' and the associated tag 'Local 1' has a value 0. In the On-State the button label says 'Hide' and the associated tag 'Local1' has a value 1. Pressing the button toggles its value between 0 and 1.

Step 2: Design pop-up Window

It is convenient to build the pop-up window as an Object Assembly. For our example, the pop-up window (object assembly) includes the following objects:

- A silvery-gray box with a gradient fill
- A text string 'Pop-up'
- An LED object (assigned the same tag as Start button)
- A button labeled 'Start' in the off state (assigned the same tag as LED), which will toggle the LED state off/on (Green/Red)

Group the objects (by dragging a box around them, to select them), and right click and select 'make Object Assembly'; there is no need to save the object assembly in the library. Right click on the object assembly and select 'Attribute Tags' from the menu, to display the Attribute Tags dialog. Select the Visibility attribute and assign the Tag 'Local 1' (the same tag as the Pop-up' button in Step 1. Toggle the 'Test' button and verify that the pop-up window (object assembly) disappears and pops-up again. Note that when you assign an Attribute Tag (Local 1) to the Object Assembly, the same Attribute Tag is assigned to each of the objects in the pop-up automatically.



4-77: Visibility Attribute Tag for Pop-Up Window - Example

Step 3: Test the screen and pop-up Window in Runtime

Save the screen (include in the test project) and Run. Verify that when you click the button (labeled Pop-up) the Pop-up window appears and when you click the button (labeled Hide) the Pop-up

window disappears. When the pop-up window appears, you may click on the Stop/Start button to turn on/off the LED.

4.13 Edit Data Display Object

After you accept the Display Object data spec and return to the design screen if you wish to edit the data specs for any data object then choose the Select tool (from the Tool bar) and double click on the data object. You may also right click on a display object and select the Properties option from the pop-up menu. You will see the dialog box for the data object selected. Make the editing changes to the data display object specs and click on OK button.

To delete a display object you created earlier, select it and use the **Del** key. You may also right click on a display object and select the Delete option from the pop-up menu. **Screen Designer** will delete the selected data object from the screen. After deletion click on Redraw if necessary.

4.14 Document Data Display Object

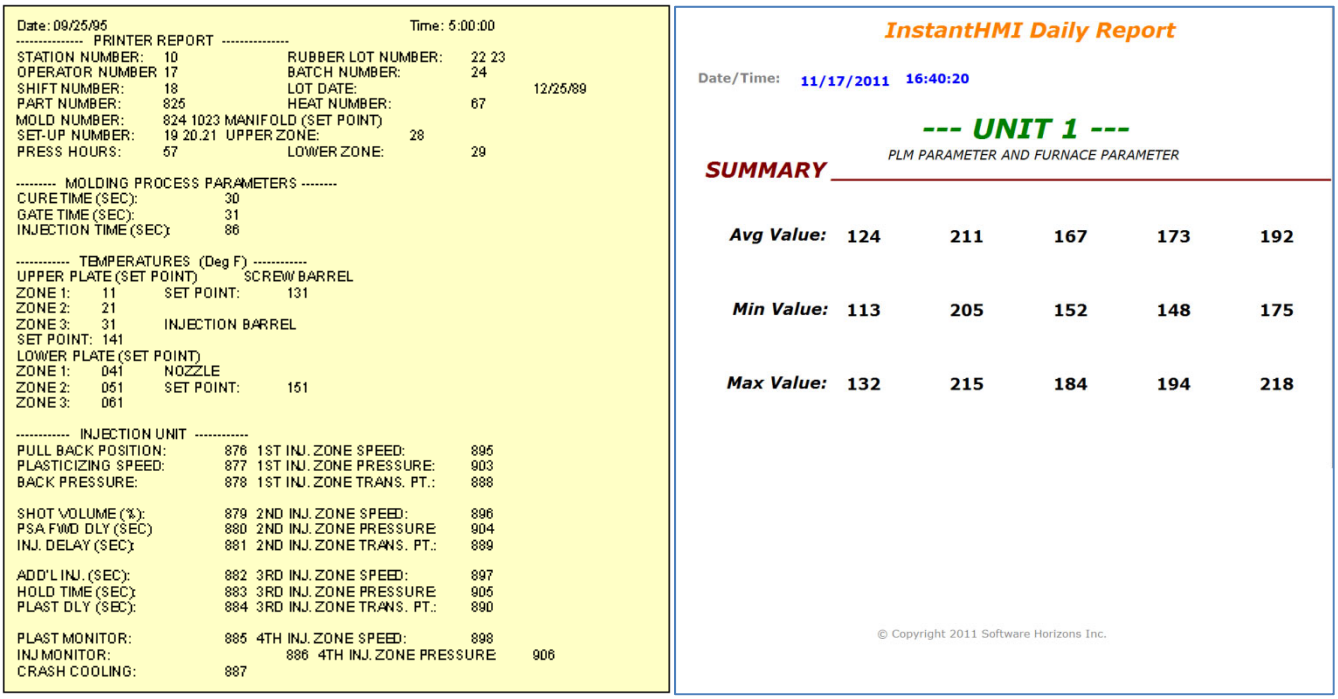
When you are finished with screen creation and saved it in a file **Screen Designer** automatically creates a doc file listing every data object included on your screen. Review the Demo project screen documentation files *.doc.

5 Report Designer

InstantHMI for Windows includes several tools: Report Designer (discussed in this Section), Macro Editor (Section 6), Script Editor (Section 7) and Data Source Manager (Section 2.3.5). All these tools are integrated into the Screen Designer discussed in Section 4.

InstantHMI 6.1 and later incorporate a totally new Report Designer, which supports RTF (rich text format for reports on PC Runtime platform) in addition to the legacy textual reports retained for non-PC Runtime platform. In addition, Graphical Report Templates designed in Screen Designer (Section 5.5) are also supported. You may view the latter as 'Screen Dumps'. The Report Designer allows you to create report templates (including rich text format support for fonts, colors, pictures, etc.) which can be used to generate customized free-form printer reports. It also allows you to create spool record templates, which you can use with the help of the spooling capability in the runtime engine (Section 5.3), to print multiple reports to disk concurrently. This spooling capability in effect provides you with multiple (up to 100) virtual printers. You may also merge the spooled reports into a single printed report (or another spool report) whose template is under your total control.

The Report Designer is used to create, inspect, or modify printer report and spool record templates to be used by the runtime engine (Section 9) to generate the printer and spool reports. Sample textual and rich text printer reports are shown below. **Note:** We distinguish between report templates and reports. Report Designer creates the report template files and Runtime engine uses these template files to print the corresponding reports at runtime.



Date: 09/25/95 Time: 5:00:00

---------- PRINTER REPORT ----------

STATION NUMBER:	10	RUBBER LOT NUMBER:	22 23	
OPERATOR NUMBER	17	BATCH NUMBER:	24	
SHIFT NUMBER:	18	LOT DATE:		12/25/89
PART NUMBER:	825	HEAT NUMBER:	67	
MOLD NUMBER:	824 1023 MANIFOLD (SET POINT)			
SET-UP NUMBER:	19 20.21 UPPER ZONE:		28	
PRESS HOURS:	57	LOWER ZONE:	29	

--------- MOLDING PROCESS PARAMETERS --------

CURETIME (SEC):	30
GATE TIME (SEC):	31
INJECTION TIME (SEC):	86

---------- TEMPERATURES (Deg F) ----------

UPPER PLATE (SET POINT)		SCREW BARREL	
ZONE 1:	11	SET POINT:	131
ZONE 2:	21		
ZONE 3:	31	INJECTION BARREL	
SET POINT:	141		
LOWER PLATE (SET POINT)			
ZONE 1:	041	NOZZLE	
ZONE 2:	051	SET POINT:	151
ZONE 3:	061		

---------- INJECTION UNIT ----------

PULL BACK POSITION:	876	1ST INJ. ZONE SPEED:	895
PLASTICIZING SPEED:	877	1ST INJ. ZONE PRESSURE:	903
BACK PRESSURE:	878	1ST INJ. ZONE TRANS. PT.:	888
SHOT VOLUME (%):	879	2ND INJ. ZONE SPEED:	896
PSA FWD DLY (SEC)	880	2ND INJ. ZONE PRESSURE	904
INJ. DELAY (SEC):	881	2ND INJ. ZONE TRANS. PT.:	889
ADD'L INJ. (SEC):	882	3RD INJ. ZONE SPEED:	897
HOLD TIME (SEC):	883	3RD INJ. ZONE PRESSURE	905
PLAST DLY (SEC):	884	3RD INJ. ZONE TRANS. PT.:	890
PLAST MONITOR:	885	4TH INJ. ZONE SPEED:	898
INJ MONITOR:		886 4TH INJ. ZONE PRESSURE	906
CRASH COOLING:	887		

InstantHMI Daily Report

Date/Time: 11/17/2011 16:40:20

--- UNIT 1 ---

PLM PARAMETER AND FURNACE PARAMETER

SUMMARY

Avg Value:	124	211	167	173	192
Min Value:	113	205	152	148	175
Max Value:	132	215	184	194	218

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Figure 5-1: Sample Printer Reports (Legacy Plain Text on Left and New Rich Text Format on Right)

5.1 Getting Started

If you have not installed InstantHMI LaunchPad on your PC do so now (see Appendix A). When installation is complete click on the InstantHMI icon to run the InstantHMI LaunchPad. Click on the Screens button to run Screen Designer, click on Tools → Report Designer. (You may also access Report Designer from LaunchPad directly: Setup → Reports → Report Designer.) You will see the following screen (Figure 5-2). Note that the Report Designer application window is re-sizable. You will be working with your report template in the Design Area of the Report Designer window using the Menu bar (Section 5.2). This window also has a Title bar (Section 4.1.1), a Tool bar and Format

bar (Section 5.2.3) at the top, and a Status bar (Section 5.2.3) at the bottom. Please review the discussion in Section 4.1 if you are not familiar with Report/Screen Designer Window. InstantHMI 6.1 and later incorporate a totally new Report Designer, which supports RTF (rich text format for reports on PC Runtime platform). You may create a 'report template draft' in Microsoft Word or Wordpad and copy and paste in the Report Designer window. The report template files save the RTF format in addition to the legacy textual format in order to support non-PC Runtime platforms where RTF support is not available.

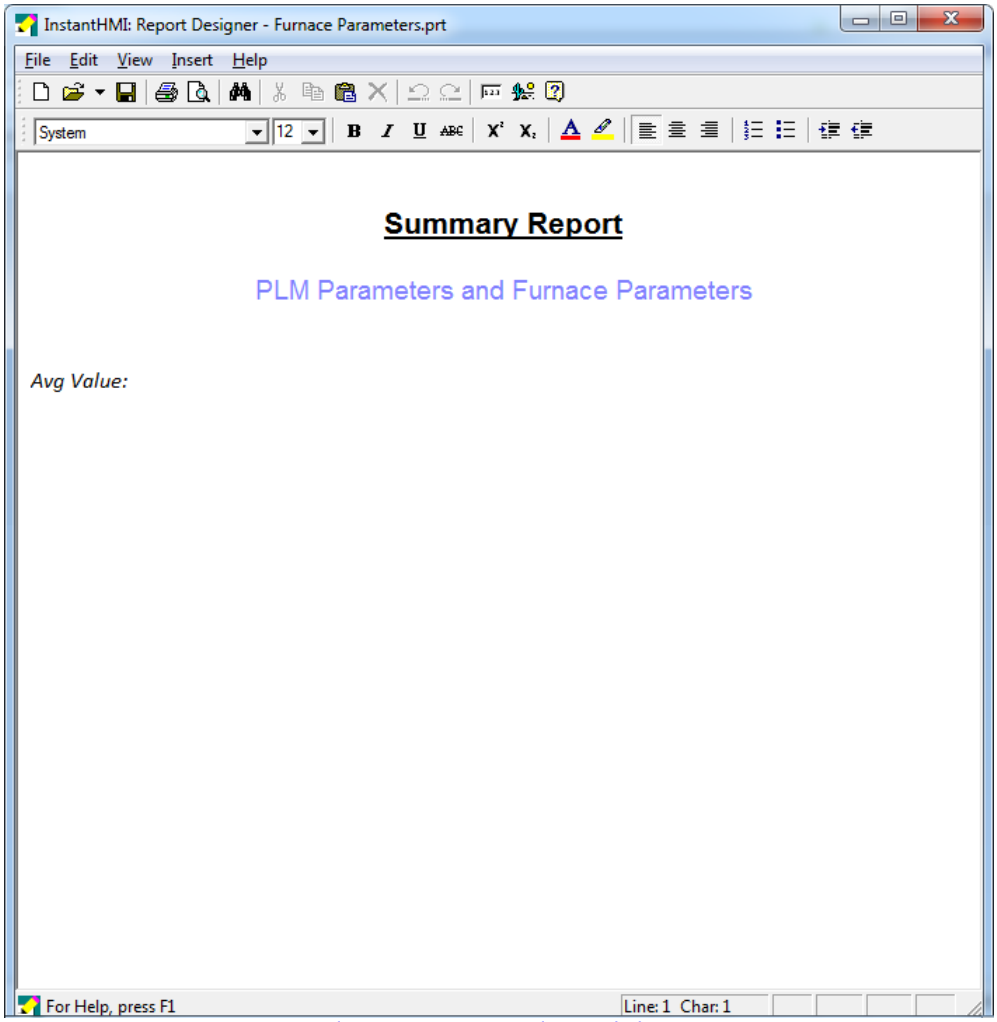


Figure 5-2: Report Designer Window

Modifying/Creating your Application Report Template
(A Thumb Nail Sketch)

You will be using the main menu and other menu commands to create your report template. The Status bar will provide instantaneous feed back. Use the context sensitive help by pressing the help key F1 after highlighting any menu item; this will tell you about the menu item selected.

Since the primary purpose of Report Designer is to create or modify printer report templates we will illustrate the use of Report Designer in this context. To modify an existing application report template, use the File, Open command to retrieve your report template file.

You may have a large number of printer reports and 100 spool reports; each printer and spool report may be of any size (not exceeding 4GB). The resources available on your PC may limit these capabilities. To create a multiple page report use the Insert → Page Break menu option or the <F5> key to indicate start of a new page in your report.

The Steps in modifying/creating your application report templates are summarized below.

Step 1. Enter Text

The behavior of the Rich Text Edit window is similar to a Word document. Use the mouse to position the cursor anywhere in the report template. The concept of a document and 'Paragraph' applies when you use the edit control keys (Up, Down, Left, Right), Home, End, <Page Up> and <Page Down> to position the cursor in the report template. Use the <Enter> key to begin a new line, <Home> key to move to the beginning of the current line, and <End> key to move to the end of the line. The Status Bar indicates where the cursor is (Line number and Character number). Your report may have numerous lines but the view will show a limited number of lines in the scrollable window on the screen at any given time. Use <Page Up> key to scroll up by one screen and <Page Down> key to scroll down one screen. Use <Ctrl Home> or <Ctrl End> to go to beginning or end of the report template.

Now type any text you wish. The only reserved character is the pipe symbol "|" which serves to identify the 'tag data' location in the report. All text entry in Report Designer is usually done in insert mode, that is, whatever you type is inserted at the cursor. You may use the Tab, Backspace, Del, Ins, Right arrow →, and Left arrow ←, for any editing in the usual manner. Note that you may set the **Tab Width** to any number of spaces you like. (See Section 9, [Runtime Engine], Tab Width = 8 parameter). Its default value is 8. Press the Ins key to toggle the insert mode to overwrite mode; when you do this text you type will replace the text to the right of the cursor. You may go back and correct or modify any part of the report template on the screen.

Step 2. Enter Data Specification

Use the 'Insert → Tag Data Field' menu to enter specifications for any data you wish to include in your report. Note: You may also insert a Picture, or a Spool Report, or a Page Break in the template.

Step 3. Save Report

Refer to Section 5.2.1 for more details. You may also use File Exit to exit Report Designer. You will be reminded to save your report template file if it is not saved.

5.2 Main Menu (Menu Bar)

The menu bar lists the main menu commands:

5.2.1 File

The File menu offers the following commands:

New	Create new application report.
Open...	Open existing application report.
Save	Save currently open application report using same file name.
SaveAs...	Save currently open application report using different file name.
Print	Print currently open report file
Print Preview	Preview printer report
Print Setup	Setup printer for printing
1. Report1.PRT	Last four report files
2. Report2.PRT	opened in Report Designer for editing.
3. Report3.PRT	You may click on any of these directly
4. Report4.PRT	to open for editing.
Exit	Exit Report Designer program.

File → New (Ctrl + N)

Use this command to create a new report template. Be sure to save the current report template if you want to preserve any changes. If you have not saved your report template, a dialog box will pop up prompting you to save. After you choose Yes or No, a blank (new) template is presented. You may click on the tool bar button or press the shortcut key Ctrl+N instead of using the menu choice to execute File New command.

File → Open (Ctrl + O)

Use this command to open an existing report template. You may click on the tool bar button or press the shortcut key Ctrl + O instead of using the menu choice to execute File Open command. You will see a File Open Dialog box.

Files of Type:

Select the type of file you want to open:

*.PRT for Printer Report Template files, and
*.SPL for Spool Report Template files.

Look in:

Select the project directory in which Report Designer will find the file that you want to open.

File → Save (Ctrl + S)

Use this command to save the current report template to its current name and directory. You may click on the tool bar button or press the short cut key Ctrl + S instead of the menu choice to execute File Save command. When you save a report template for the first time, Report Designer displays the Save As dialog box so you can name your report. If you want to change the name and directory of an existing report before you save it, choose the Save As command.

File → Save As

Use this command to save and name the current report template. Report Designer displays the Save As dialog box so you can name your report template. (To save a report template with its existing name and directory, use the Save command.) The following options allow you to specify the name and location of the file you're about to save.

File Name:

Type a new filename to save a report template with a different name. A filename can be a long string of characters and an extension (file type). Report Designer adds the extension you specify in the 'Save As Type' box.

Save in:

Select the directory in which you want to store the report template.

File → Print (Ctrl + P)
Use this command to print the report template file on your printer. Windows Print Manager takes care of the printing details by presenting a Print Dialog Box. If your printer is not setup correctly use the Print Setup command.

File → Print Preview
Use this command to preview printer report on your screen. RTF print reports will use actual margin parameters instead of just RTF indentation. Use print preview to have better WYSIWYG. If your report margins are not setup correctly use the Print Preview command to adjust them.

File → Print Setup
Use this command to setup your printer for printing. Windows Print Manager takes care of the printer setup details by presenting a Print Setup Dialog Box.
Note: InstantHMI allows you to choose Portrait as well as Landscape orientation. Use Page Break (Section 5.2.4) to control your report pagination.

File → Exit
Use this command to end your Report Designer session. Report Designer prompts you to save your current application report template if necessary. You will now return to the Screen Designer or LaunchPad program from where the Report Designer was launched.

5.2.2 Edit

The Edit menu lists the following five commands:

Undo	Ctrl + Z
Redo	Ctrl + Y
Cut	Ctrl + X
Copy	Ctrl + C
Paste	Ctrl + V
Select All	Ctrl + A
Delete	Delete
Find…	Ctrl + F
Find Next	F3
Replace	Ctrl + H
Tag Data Field	Ctrl + E
Properties…	Ctrl + P

Undo (Ctrl + Z)
Use this command to reverse the last editing action, if possible.

Redo (Ctrl + Z)
Use this command to restore the last Undo action, if possible.

Cut (Ctrl + X)
Use this command to delete the currently selected text from the report and copy it to clipboard. To select text in the report, position the mouse at the beginning of the selection, click and drag the mouse to the end of the selection. The selected text will be highlighted. This command is not available (grayed) if there is no text currently selected. Cutting data to the clipboard replaces the previously stored clipboard contents. You may use the toolbar Cut icon or the shortcut key Ctrl + X to execute the Cut command.

Copy (Ctrl + C)
Use this command to copy selected text onto the clipboard. This command is not available (grayed out) if there is no text currently selected. Copying data to the clipboard replaces the previously stored clipboard contents. You may use the toolbar Copy icon or the short cut key Ctrl + C to execute the Copy command.

Paste (Ctrl + V)
Use this command to insert a copy of the clipboard contents at the insertion point (cursor location). This command is not available if the clipboard is empty. You may use the toolbar Paste icon or the shortcut key Ctrl + V to execute the Paste command.

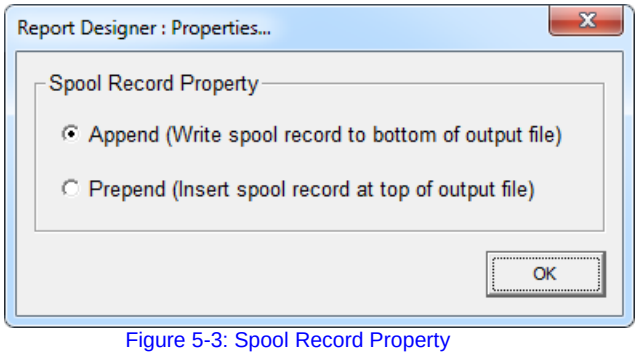
Select All (Ctrl + A)
Use this command to select the entire content of the report.

Delete (Delete)
Use this command to delete the selected content.

Find… (Ctrl + F), Find Next (F3), and Replace (Ctrl + V)
Use these commands in the usual manner to find and/or replace text in the report template.

Tag Data Field (Ctrl + E)
See Section 5.2.5.

Properties… (Ctrl + P)
Use this command to set the properties of the report. At present the only settable property is for Spool Records: Append or Prepend.


Report Designer : Properties...
Spool Record Property
Append (Write spool record to bottom of output file)
Prepend (Insert spool record at top of output file)
OK
Figure 5-3: Spool Record Property

5.2.3 View

The View Menu lists the following two commands:

Tool Bar
Use this command to display or hide the Tool Bar, which includes buttons for some of the most common commands in Report Designer, such as File Open. A check mark appears next to the menu item when the Toolbar is displayed.

Figure 5-4: Tool Bar

The toolbar is displayed across the top of the Report Designer window, below the menu bar. The toolbar has eighteen buttons that provide quick mouse access to commands in Report Designer as shown in the table below. You click the appropriate button on the toolbar to execute the desired command.

Button	Command
File New	Open a new report
File Open	Open an existing report using the Open dialog box. Click Arrow to display a list of Repots where you can locate and open the desired file.
File Save	Save the active report with its current name. If you have not named the report, displays the Save As dialog box.
File Print	Print the report template.
Print Preview	Preview the printer output.
Find	Find any desired text string in the report template.
Edit Cut	Remove selected text from the report and store it on the clipboard.
Edit Copy	Copy the selection to the clipboard.
Edit Paste	Insert the contents of the clipboard at the insertion point.
Delete	Delete selected text from the report.
Undo	Undo the last edit action
Redo	Redo what Undo did and restore the last edit action.
Tag Data Field	Insert Tag Data Field and enter its properties.
Insert Picture	Insert a picture in the report template.
Help About	Show information about Report Designer

Figure 5-5: Tool Bar Buttons

Format Bar

Use this command to display or hide the Format Bar, which includes buttons for text formatting. The Format Bar has seventeen buttons that provide quick mouse access to format commands in Report Designer as shown in the table below. You click the appropriate button on the format bar to execute the desired command.

	Button	Command
	Font	Change Font face.
	Font Size	Change Font size.
	Bold	Make the selected text bold.
	Italic	Italicize the selected text.
	Underline	Underline the selected text.
	Strikethrough	Draw a line through the middle of the selected text.
	Superscript	Create small text above the text baseline.
	Subscript	Create small text below the text baseline.
	Font Color	Change the text color.
	Text Highlight	Mark the selected text in highlight color.
	Align Left	Align selected text to the Left.
	Center	Center the selected text.
	Align Right	Align selected text to the Right.
	Numbering	Start a numbered list.
	Bullets	Start a bulleted list.
	Increase Indent	Increase the indent level of the paragraph of text.
	Decrease Indent	Decrease the indent level of the paragraph of text.

Figure 5-6: Format Bar Buttons

Status Bar

Use this command to display or hide the Status Bar, which describes the action to be executed by the selected menu item or depressed toolbar button, and keyboard latch states. A check mark appears next to the menu item when the Status Bar is displayed.

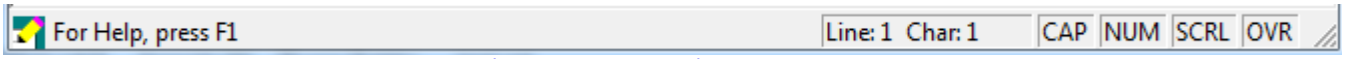


Figure 5-7: Report Designer - Status Bar

The status bar is displayed at the bottom of the Report Designer window and consists of seven panels as shown above. The Command Prompt panel (on the left of the status bar) describes actions of menu items (or displays 'For Help, press F1') as you use the mouse to navigate through menus. If after viewing the description of the command you do not wish to execute the command, then release the mouse button while the pointer is off the command or press the Esc key.

The 'Line: and Char:' panels identify the mouse cursor position; Line: shows line number in the report template and Char: shows the character position on the current line. The four panels labeled CAP, NUM, SCRL, OVR describe the state of the Caps Lock, Num Lock, Scroll Lock and Insert keys respectively. When any of these locks are engaged then the corresponding panel indicator will show up. To resize the Report Designer window (make it smaller or bigger), point to the window's borders or corners (shown on the Status bar as 'sculptured slant lines'). When the mouse pointer changes to a two-headed arrow, drag the border or corner to shrink or enlarge the window.

5.2.4 Insert

Page Break (F5)	Start a new page
Tag Data Field (F2)	Insert a new tag data field
Spool Report File (F8)	Insert a spooled report file
Picture	Insert a picture (Logo etc.)
Table	Insert a Table

Page Break (F5)
Use this command to insert a new page character in the report; printer will start printing on a new page at this point in your report. You may use the shortcut key F5 for this command.

Tag Data Field (F2)
See Section 5.2.5.

Spool Report File (F8)
Spool report files are created at Runtime. Spool reports are exactly like printer reports; the only difference is that they are printed on a virtual printer (that is, written to a disk file). Spooling is a very powerful feature used in data logging and reporting. This feature is covered briefly here with a more detailed discussion in Section 5.3.

Report Designer supports the special data format **Spool_file**. When you use the 'Spool_file' data format you must enter the Spool #; the Tag Name field in the dataspecs will be ignored. For example, type in 5 for "Spool #" if you wish to include in your printer report the spooled report SPOOL.S05 ('SPOOL' represents the name of fifth spool template in your project). Of course, you must create the spool record template to generate the spooled report SPOOL.S05 at a later time using Report Designer. Note: For convenient file management of the spooled reports, you also select a 'Spool Function' (Section 5.3) from a pull-down list.

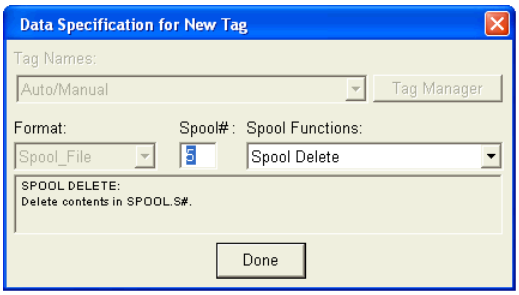


Figure 5-8: Insert Spool Report – 'Spool File' Dataspec

Note: Usually spool files are meant to be inserted in printer record templates. While spool files may also be inserted in spool record templates, you should take care to do this with appropriate file management spool function to achieve your intended report .

Picture
Use this command to insert a picture (ex. Logo) in the report.

Table
Use this command to insert a table in the report. Any cell in the Table may include a Tag Data Field.

5.2.5 Tag Data Field

You have three choices:

New Tag (F2)	**Insert a new tag data spec**
Edit Tag (Ctrl + E)	**Edit an existing tag dataspec**
Delete Tag (Ctrl + D)	**Edit an existing tag dataspec**

New Tag (F2)

You may include data from any data source (your PLC, other I/O devices) by referencing its tag in your report. Locate the text cursor where you wish to include data in your report. Click on Insert → Tag Data Field menu (or use the short cut key F2) to include data from any tag in your report. A pop up dialog box (Figure 5-9) appears. Select a tag name (which has the data source associated with it) from the tag database, or create a new tag using the Tag Manager.

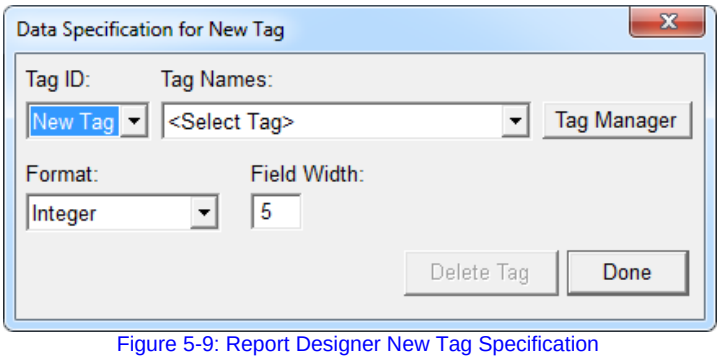


Figure 5-9: Report Designer New Tag Specification

The discussion of Data Format in Section 4.11.2 applies here for Integer, Binary, Hex, Long, Boolean, Message, String, Fixed, Float, Double, BCD, Date, Time, Unsigned Int, Unsigned Fixed, and Long Fixed. When you use binary and Hex formats in your reports, Binary data will be printed as 16 digits (value 0 or 1) and Hex data will be printed as 4 digits (value 0-9, A-F).

Specify the data Format to be used in the report by clicking on one of the formats in the pull-down list. Select a message group if display format is Message. To enter Field Width, move the mouse cursor inside the edit control box (where it changes to an I-beam), click the left button, and then type the number desired. If you change your mind about creating the new data item click on the **Cancel 'X'** button. Click on the **Done** button to accept your data specs; you will return to the report design window where your data position will be indicated by a pipe symbol followed by a three digit tag number. (The pipe symbol '|' identifies a tag and is reserved for this purpose in printer report and spool record Templates.)

Edit/Delete Tag

To **Edit** (or review) your tag move the mouse cursor to the tag data field (includes the pipe symbol and the tag id number) and click the left button to position the blinking text entry cursor. Now click on Edit →Tag Data Field command (or use the short cut key Ctrl + E). Make sure that the Data spec dialog box shows the Tag number you selected (and not a 'New Tag' being created). Go through the Dialog box selections and make changes as needed.

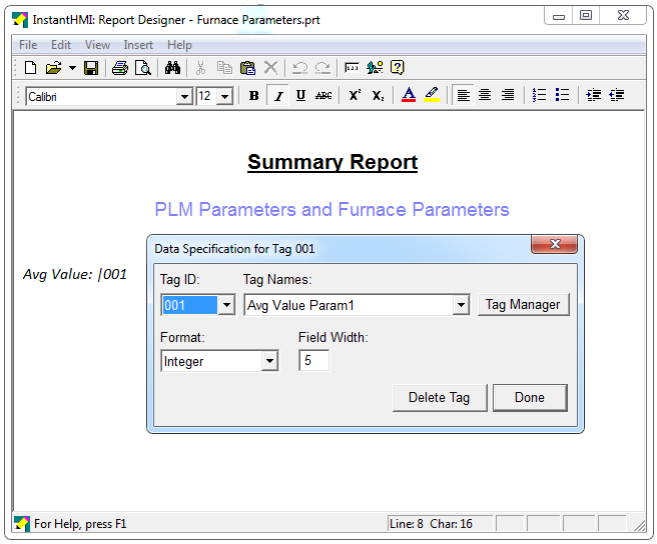


Figure 5-10: Report Designer Edit Tag Specification Example

To **Delete** the data field being edited click on the 'Delete Tag' button. Note the Tag ID selected for deletion. If desired, you may use the pull-down list to select a different tag id for deletion. Click on Delete Tag button to confirm deletion of selected tag. Alternatively, move the mouse cursor to the tag data field and select it (highlight the pipe symbol and the tag id number) and type the Del key. (Alternatively, delete the entire line containing the tag id .)

Caution: When you create a data spec for a field, you will notice a **Tag** number appearing immediately after the pipe symbol "|". It is important that you do not change this Tag number if you want the correct information printed at runtime. The report and spool template files have embedded Tag information associated with these tag numbers. Use only Report Designer to edit these files. Use of any other program will corrupt the Tag information and render these files useless.

5.2.6 Help

The Help menu includes the following commands:

Table of Contents	Shows an index to Report Designer topics on which you can get help.
About Report Designer	Displays the version number of Report Designer program.

Table of Contents

Use this command to display the Report Designer 'Table of Contents'. From this index of Help topics, you can select any desired topic to browse through the available information online.

You can click the Contents button in the Help window whenever you want to return to the Index (Table of Contents) of Help topics. You may also click on the Search button and look for help on topics of interest to you.

Note: Since the Report Designer Help System runs in its own window, you may run Report Designer and Help in two tiled windows side by side; use the Report Designer window to do your work after displaying the help on the topic you need in the Help window. There are many different ways you can use the Help System; experiment and find the way that suits the way you work.

About Report Designer

Use this command to display information about Report Designer (copyright notice and version number).

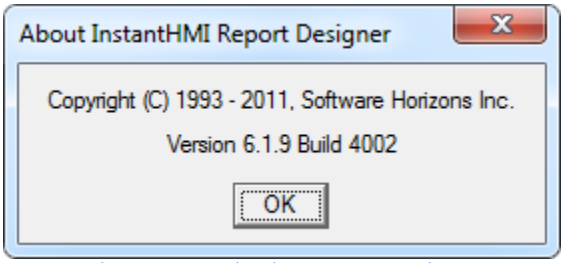


Figure 5-11: Help About Report Designer

5.3 Spooling

Traditionally, spooling has been used as an intermediate step to printing and allows the running program to do other things while 'printing in the background'. Spooling is a very powerful reporting feature in the runtime which uses the Spool Templates to produce Spool Reports. Spooling can also be used for data logging. Spool reports are exactly like printer reports; the only difference is that they are created on a virtual printer (that is, written to a disk file).

You may use spool record templates along with the spooling capability discussed in this section to print multiple reports (up to 99) to disk concurrently. You may also merge the spooled reports into a single printer report (as well as another spool report) whose template is under your total control. Spooling feature is available on PC, CE and Pocket PC platforms. Note: A settable property of Spool

templates allows you to create spool reports with new spools at the top (that's reverse chronological order, see Section 5.2.2).

5.3.1 Naming Spool Templates

For user convenience named spool templates are preferable; but to allow access to spool template files from controller registers numbered template files '#.SPL' (# = 1,2,...,99) are more convenient. Here we describe how you may assign any named spool record template file 'SpoolName.SPL' to act as the numbered template file '#.SPL' (# = 1,2,...,99). In LaunchPad, click on Setup → Reports and then click on the radio button 'Spool'. In the 'Available (Spool) Report Templates' panel select 'SpoolName.SPL'. In the 'Assigned (Spool) Report Templates' panel click on 5 and then click on the 'Assign >' button.

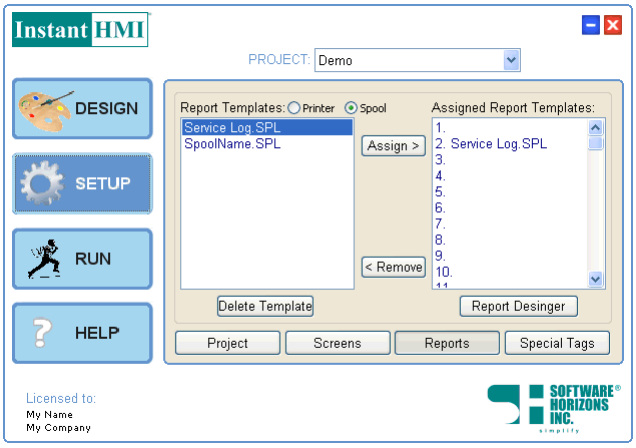


Figure 5-12: Named Spool Template assignments

Repeat this with each available spool report that is to be used in the project. (Note that for the sake of backward compatibility any available spool reports with names 1.SPL, 2.SPL, etc. will be implicitly assigned to slots 1,2,etc. (This implicit assignment will not be shown explicitly unless you make the corresponding assignments or override the corresponding assignments). Click the Remove button to clear (or reset) a specific assignment. The assignments are recorded in the Project.INI file in the Project folder.

Note that at runtime, the spooled reports will include the spool template file name in addition to the 'YYMMDDHH' etc. name as documented in Section 5.3.3. For example, assume that the spool template file 'Service Log.SPL' was assigned the slot '2.' and the Spool Register contained the value 3074 (i.e., Archive SPOOL.S02 into file YYMMDDHH.S02 as per the old scheme using numbered spool template file 2.SPL). The Spool Register value 3074 will then cause the spooled report file SPOOL.S02 to be archived under the name 'YYMMDDHH Service Log.S01 identifying by name the spool template file used in producing the spooled report SPOOL.S02.

5.3.2 How Does Spooling Work?

Spooling feature in InstantHMI is controlled by a Special Register (the Tag named 'Spool Register' in the Tag Group 'Special Registers') setup in InstantHMI as shown in Section 9.3.3 and is summarized below:

What is done by the PC/InstantHMI

At design time 'Spool Record template' is setup in the spool template file. At runtime the spool register is read to determine appropriate (event driven) action. The operator may also demand spooling action through the runtime Reports → Spool menu. Current data requested in the spool template file is spooled (stored) in a spool report file.

What is done by PLC/Ladder Logic
Trigger the spooling action (in InstantHMI Runtime) as an event by storing the appropriate value in the Spool Register.

How to set up a Spooling/Data Logging System
Create up to 99 spool template files. Edit the tag 'Spool Register' to suit your spool register address and data source. Determine which spooling function you want. Ensure the PLC logic loads the appropriate value into the Spool Register and thus triggers the desired spooling function.

5.3.3 Spool Register Functions

The (16 bit) Spool Register will be interpreted as follows. The low byte (8 bits) in the Spool Register will refer to the spool template file number (1.SPL, 2.SPL, etc). You may use up to 99 spool template files 1.SPL, 2.SPL, ..., 99.SPL. The High byte (8 bits) in the spool register will provide additional functionality as discussed below. The default file SPOOL.SXX (the spool report) will contain the spooled information. Note: SPOOL.SXX is the file, which is included in your printer reports, when you use the Spool_file data format.

The table in Figure 5-13 lists the Spool Register Functions.

SPOOL REGISTER FUNCTIONS			
High Byte	Low Byte	Register Word (Decimal)	Function Selected/ Action Desired
00	XX	Spool #	SPOOL INDIVIDUAL Spool in file SPOOL.SXX using record format in spool template file XX.SPL Note that XX can not be 00 here.
01	XX	256 + Spool#	SPOOL DELETE Delete contents in SPOOL.SXX. Note that XX can be 00.
02	XX	512 + Spool#	SPOOL AGGREGATE Spool in file SPOOL.S00 using record format in XX.SPL. Use this function to merge information from different XX.SPL.
03 - 09	XX		Reserved
10	XX	2560 + Spool#	ARCHIVE SECONDS Archive SPOOL.SXX into file DDHHmmss.SXX (Delete contents in SPOOL.SXX). Note that XX can be 00. 'DDHHmmss' reflects the archive Date-Time stamp.
11	XX	2816 + Spool#	ARCHIVE MINUTES Archive SPOOL.SXX into file MMDDHHmm.SXX (Delete contents in SPOOL.SXX). Note that XX can be 00. 'MMDDHHmm' reflects the archive Date-Time stamp.
12	XX	3072 + Spool#	ARCHIVE HOURS Archive SPOOL.SXX into file YYMMDDHH.SXX (Delete contents in SPOOL.SXX). Note that XX can be 00. 'YYMMDDHH' reflects the archive Date-Time stamp.
13	XX	3328 + Spool#	ARCHIVE DAYS Archive SPOOL.SXX into file YYMMDD.SXX (Delete contents in SPOOL.SXX). Note that XX can be 00. 'YYMMDD' reflects the archive Date stamp.
14 - 19	XX		Reserved
20	XX	5120 + Spool#	SAVE SECONDS Save information for XX.SPL into file DDHHmmss.SXX (New spool file every second)
21	XX	5376 + Spool#	SAVE MINUTES Save information for XX.SPL into file MMDDHHmm.SXX (New spool file every minute)
22	XX	5632 + Spool#	SAVE HOURS Save information for XX.SPL into file YYMMDDHH.SXX (New spool file every Hour)
23	XX	5888 + Spool#	SAVE DAYS Save information for XX.SPL file into file YYMMDD.SXX (New spool file every day)
24 - 29	XX		Reserved

Figure 5-13: Spool register Functions

You will note that the table in Figure 5-13 lists three groups of functions.

Function Group	Spool Register Contents
Spool	(High byte = 0-2, low byte = 0-99)
Archive	(High byte = 10-13, low byte = 0-99)
Save	(High byte = 20-23, low byte = 0-99)

Using these function groups the Spool Register Functions are summarized for your convenience in the table in Figure 5-14 and also illustrated in Figure 5-15.

SPOOL REGISTER FUNCTIONS SUMMARY (Register Value = Spool Template File Number + Adder)			
		OPTION	ADDER = 256 X OPTION
SPOOLING			
	SPOOL INDIVIDUAL	00	0
	SPOOL DELETE	01	256
	SPOOL AGGREGATE	02	512
ARCHIVING			
	SECONDS	10	2560
	MINUTES	11	2816
	HOURS	12	3072
	DAYS	13	3328
SAVING			
	SECONDS	20	5120
	MINUTES	21	5376
	HOURS	22	5632
	DAYS	23	5888

Figure 5-14: Spool Register Function Summary

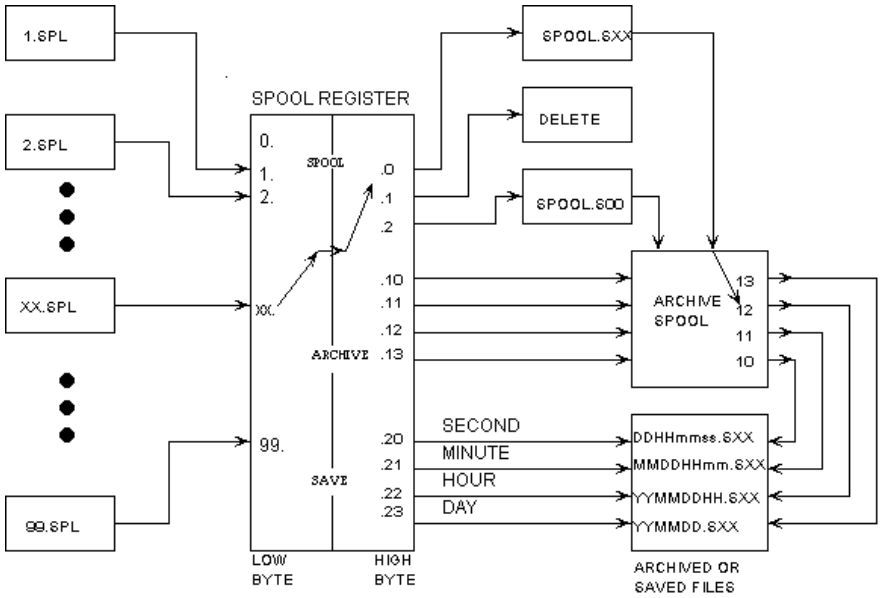


Figure 5-15: Illustrating Spool Register Functions

Examples

Four examples are provided to illustrate the use of Spooling feature in InstantHMI.

	Spool Register Content	
	High Byte (Spool Option)	**Low Byte** (Spool Template File #)
Bit Number	**f e d c b a 9 8**	7 6 5 4 3 2 1 0
Example 1,4,5	0 0 0 0 0 0 0 0	0 0 0 0 0 1 0 1
Example 2	0 0 0 0 0 0 0 1	0 0 0 0 0 0 1 0
Example 3	0 0 0 0 0 0 1 0	0 0 0 0 0 0 1 1

Example 1: Spool in file SPOOL.S05 using record format 5.SPL
Value in the Spool Register = 5
Spool Template file selected = SPOOL.S05
Spool option selected = 00

Example 2: Delete contents in SPOOL.S02
Value in the Spool Register = 258
Spool Template file selected = SPOOL.S02
Spool option selected = 01

Example 3: Spool in aggregate SPOOL.S00 using 3.SPL
Value in the Spool Register = 515
Spool Template file selected = SPOOL.S03
Spool option selected = 02

Example 4: Include Spool Report 'SPOOL.S05' from Example 1 in Printer Report 1.PRT
Figure 5-16 illustrates use of spooled report. One spool record will be spooled (saved) to disk every time a request is made to activate the spool report. The saved spool report in our example will be named SPOOL.S05. The extension S05 indicates that the spool record template used for the spool report was 5.SPL . The spool activation request is made to runtime engine by changing the zero value in the Spool Register to the spool template "File ID", 5 in our example. The Spool Register is discussed in Section 9.2. and Section 5.3.3. When the spool register has the value 5, the data record according to record template 5.SPL will be spooled to disk. This can be repeated as often as desired based on events detected in the PLC. When a request is made to print the report as per report template 1.PRT containing a data format spool_file with Spool # = 5, the entire data spooled to disk in file SPOOL.S05 will be included in the printer report (see Example 5, for a practical application).

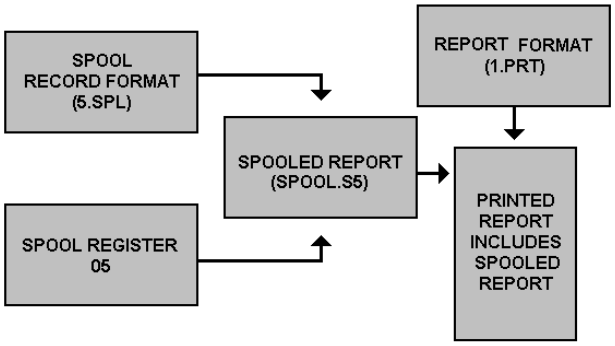


Figure 5-16: Creating Spooled Report 'SPOOL.S05' to include in Printer Report

Example 5: Creating 'Summary of Defects' Report
Suppose you wish to print a report that summarizes the defects produced during a production run. Assume that each time a defect is detected during the run the relevant data in three registers (1, 2 and 3) must be recorded. (PLC does not maintain a historic record of these registers.) Other reports also must be printed during the same production run on the same (physical) printer. The spooling feature provides the answer to this demand.

Figure 5-17 shows the "Summary of Defects" report template 1.PRT, which includes data from the spool report file SPOOL.S5. This report template 1.PRT contains 4 data tags 1 - 4 discussed below:

Tag 001: This dataspec is created using 'Insert → Spool File' command in Report Designer and requires that spooled data SPOOL.S5 (using the spool record template 5.SPL) be included here. The number of spooled records included will depend on the number of defects, which determines how many times the spooling action will be requested. This is controlled by operator demand at run

time and by the Spool Register contents (events). Our record format 5.SPL specifies one line of data sampled from Registers 1-3.

Tag 002: The Register 101 contains total of 'Reg 1 Data' column as maintained in the PLC.

Tag 003: The Register 102 contains total of 'Reg 2 Data' column as maintained in the PLC.

Tag 004: The Register 103 contains total of 'Reg 3 Data' column as maintained in the PLC.

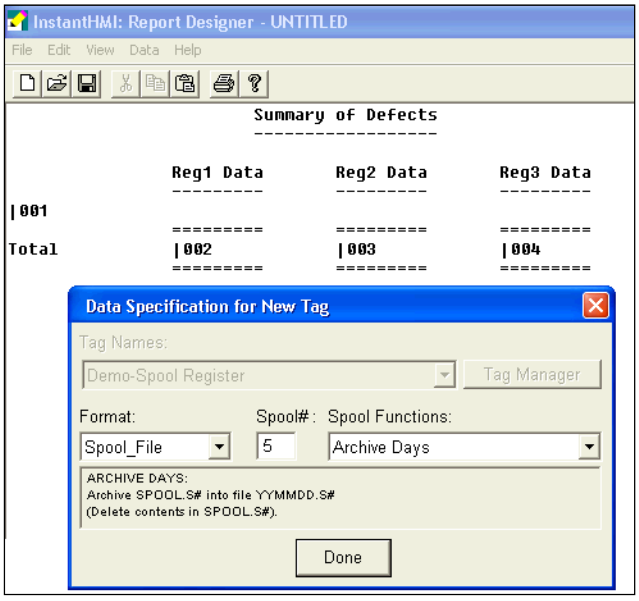


Figure 5-17: Sample Printer Report Including 'Spooled Report'

The spool record template file 5.SPL shown in Figure 5-18 contains a single line starting with "Spool data:". The tag information (tags 001, 002, 003, stored in 5.SPL by Report Designer is used by run time for spooling to disk the data corresponding to Test Tag 1, Test Tag 2 and Test Tag 3. (**Note:** Do not confuse the Tags 001, 002, 003 in 5.SPL with the same tag numbers in 1.PRT. They contain different data specs). For illustration we have shown in Figure 5-18 the data spec dialog box for Tag 003 (Test Tag 3) in Spool Template 5.SPL.

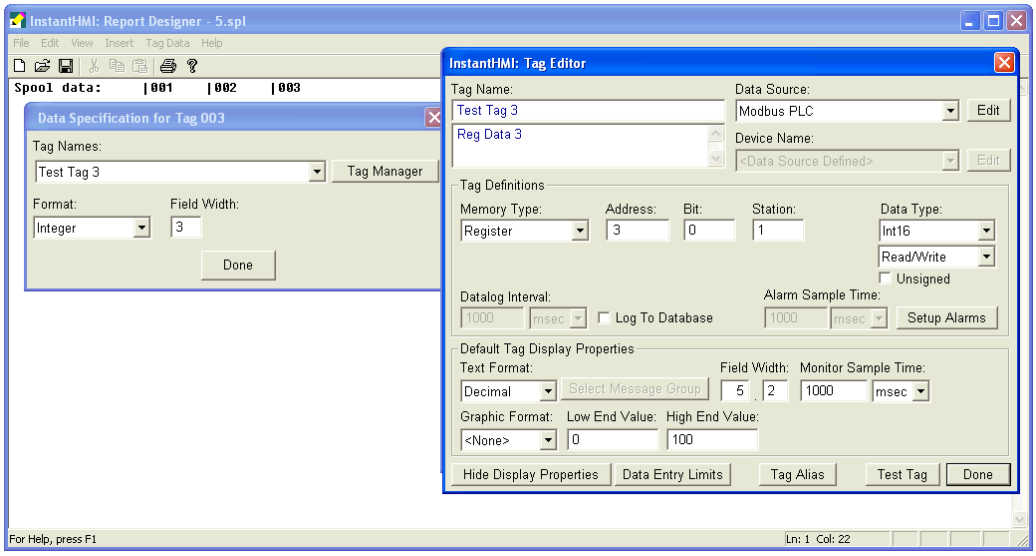


Figure 5-18: Spool Record Template 5.SPL

Suppose data is spooled to disk three times due to spooling events ("defects") triggered by the spool register. Suppose Register 1 had the values 101, 102, 103 at the three spooling instances. Similarly, let Register 2 have the values 201, 202, 203 and Register 3 have the values 301, 302, 303 at the

same three spooling instances. The PLC registers 101, 102, 103 are assumed to be programmed in the PLC to accumulate the total of the values in registers 1, 2 and 3 respectively, at the spooling instances. Similarly, it is assumed that the ladder logic accepts input from the operator (when a visual defect is detected) and enters the trigger value '5' in the Spool Register. Suppose the report 1.PRT is printed (on demand by the operator) at this point. You will see the report shown in Figure 5-19. Notice that the three 'Spool data' records are embedded in the printer report.

Summary of Defects

	Reg 1 data	Reg 2 data	Reg 3 data
Spool data:	101	201	301
Spool data:	102	202	302
Spool data:	103	203	303
	====	====	====
Total:	306	606	906
	====	====	====

Figure 5-19: Printed Report Using 1.PRT

Note: You may view the Spool Report in the LaunchPad (while the runtime is running) as illustrated in Figure 5-20.

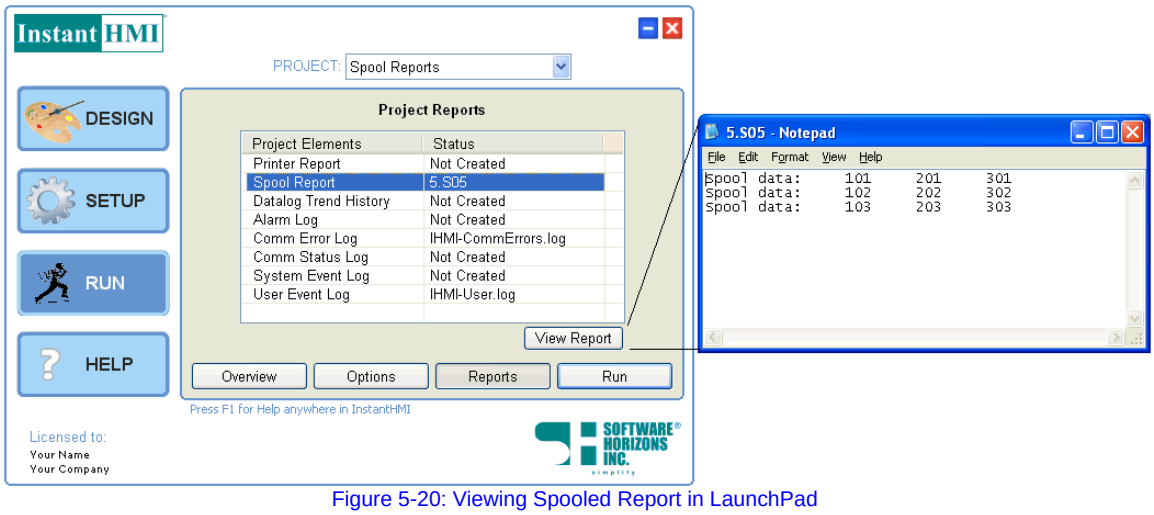


Figure 5-20: Viewing Spooled Report in LaunchPad

5.3.4 Data Logging using Spool Register Functions

You may create up to 99 spool template files 1.SPL, 2.SPL,..., 99.SPL to define different data record formats as discussed in Section 5.3.1. InstantHMI allows data logging to disk using two different methods as discussed below.

Method 1

Save data directly in disk files created every day, hour, minute, or second. The Spool Register triggers the saving of data by its non-zero content (Spool Function). InstantHMI resets the spool register back to zero after performing the required function. The low byte value (1-99) selects one of the spool template files 1-99 for the data record format. The high byte value (20-23) determines the duration for which data continues to be saved in the same file: one Day, one Hour, one Minute or one Second. The saved file names depend on the year YY, day DD, hour HH, minute mm, second ss, and the spool template file XX.

Example: Datalog into a new file every hour
The Spool Register has the value 5635 (with high byte value = 22, and low byte value = 3). It causes a data record according to the data format in 3.SPL to be saved in an hourly file (99112010.S03) when the date and time are YY = 99, MM = 11, DD = 20, HH = 10 (10AM on 20th Nov 99). Until the time is past 11AM on this day, each time the Spool Register contains the value 5635, a new data record according to the template in 3.SPL will be appended to the spool report file 99112010.S03.

Method 2
Use a two step process to save data in disk files created every day, hour, minute or second.

Step 1: **Spool** (save) data in an intermediate file SPOOL.SXX. The value in the low byte (1-99) selects the spool template file 1.SPL - 99.SPL used for the data record format. When high byte = 0, and low byte = xx, data will be spooled in separate spool files SPOOL.SXX using the format in corresponding template file XX.SPL. When high byte = 2, and low byte = xx, data will be spooled in a single aggregate spool file SPOOL.S00 using the record format XX.SPL. Thus you may control the data that gets collected in up to 100 different spool report files in a very flexible manner by controlling the Spool Register contents. Note that at any time you can **delete** (flush) the contents of the individual spool report file SPOOL.SXX (XX = 1-99) or the aggregate spool file SPOOL.S00 by setting the Spool Register high byte = 2 and low byte = 0-99.

For example, if the Spool Register has the value 2 (high bye = 0, low byte = 2), then a data record according to the template 2.SPL will be saved in the spool report file SPOOL.S02. If the Spool Register has the value 514 (high byte = 2, low byte = 2) then a data record according to the template 2.SPL will be saved in the aggregate spool report file SPOOL.S00. If the Spool Register has the value 258 (high byte = 1, low byte = 2), then the spool report file SPOOL.S02 will be deleted. If the Spool Register has the value 256 (high byte = 1, low byte = 0), then the aggregate spool report file SPOOL.S00 will be deleted. Note: The Spool Report files SPOOL.SXX may be included in printer reports as discussed in Section 5.2.5 and then flushed (deleted) as discussed here.

Step 2: **Archive** the spooled data from Step 1. Archiving allows you to save the individual spool reports SPOOL.SXX (XX = 1-99) or the aggregate spool report SPOOL.S00 in disk files created every day, hour, minute or second as in Method 1. The high byte value (10-13) determines the saved file name: Day (YYMMDD), Hour (YYMMDDHH), Minute (MMDDHHmm), or Second (DDHHmmss). The low byte value (xx = 0 - 99) and the corresponding spool report SPOOL.SXX determines the saved file extension. Note that when you archive any spool report, its contents are automatically deleted (flushed).

Example: Archive Logged Data into a new file every hour
The Spool Register has the value 3074 (high byte = 12, low byte = 2). The data records in the spool report file SPOOL.S02 will be archived in the hourly report 99112010.S02 (assuming the time was 10AM and the date was 20 Nov 99) and the SPOOL.S02 will be flushed so that it is ready to receive new data records. If the Spool Register has the value 3074 again during the same hour (10AM) additional records stored in the spool report SPOOL.S02 will be appended to the archive 99112010.S02.

5.4 Creating Reports at Runtime

5.4.1 Using Reports → Print Menu at Runtime

Use the Reports → Print command to print a report on the printer. The report printed will correspond to the screen displayed on the monitor. That is, if you are looking at screen 2 and use the Print command then report 2.PRT will be printed. Of course, the format and content of the report is totally flexible and determined by you.

Note that using the SPOOL command in conjunction with the PRINT command the operator can produce totally different reports to suit diagnostic or other special needs.

5.4.2 Using Reports → Spool Menu at Runtime

If you click on Report → Spool menu choice when you are looking at screen XX at runtime the effect is same as setting the spool register Upper Byte = 00, Lower Byte = XX. The Runtime Engine will add a data record according to the template XX.SPL in the spool report file SPOOL.SXX.

5.4.3 Using Spooled Data in Printer Reports

Data spooled in spool report files SPOOL.SXX may be included in printer reports using the Insert → Spool File command in Report Designer. Note that the added functionality listed in Figure 5-13 and Figure 5-14 are available even when you use the Spool_file data format. The 'File ID' together with your choice of 'Spool Register Function' from the pull down list in the data specification dialog (Section 5.2.4) generate the equivalent Spool Register word. While printing a report, which calls for the inclusion of data in "Spool_file" format, only the existing spools SPOOL.SXX will be used.

5.5 Creating, Viewing and Printing Graphical Reports

Note: InstantHMI 6.1 and later support Rich Text Format in Report Templates (as discussed in Section 5.1, 5.2). This allows the inclusion of various Fonts, colors and pictures in your report. This may make the use of Graphical Screen Reports *.gprt unnecessary.

5.5.1 Creating Graphical Report Templates in Screen Designer

Use the Screen Designer (Section 4) to create any Graphical Report Templates. The only thing that distinguishes a Screen from a Graphical Report Template is the file name extension. The Screen files are named *.scr; Graphical Report Template files are named *.gprt as contrasted with the Textual Report Template files, which are named *.prt. The distinction between a normal Screen and a Graphical Report Template is made only when you save the file you created in Screen Designer (*.scr vs. *.gprt). A 'Sample Weekly Report' template created in Screen Designer is shown here. See Task Scheduler (Section 16) for scheduling weekly reports. Note that in a graphical report you may use any available fonts (Italic, Bold, etc.) and any graphical objects (Logo, .jpg, .bmp, .gif, etc.).

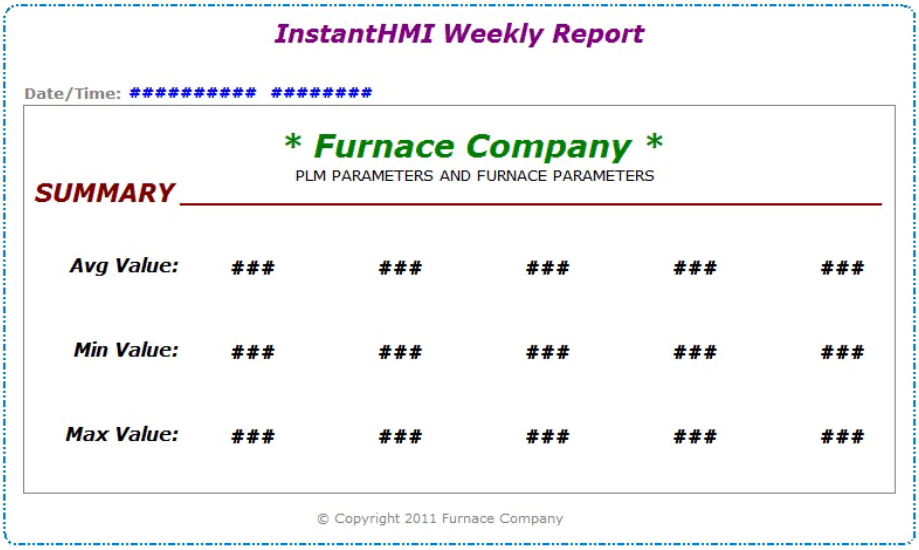

InstantHMI Weekly Report
Date/Time: ########## ########
* Furnace Company *
PLM PARAMETERS AND FURNACE PARAMETERS
SUMMARY
Avg Value: ### ### ### ### ###
Min Value: ### ### ### ### ###
Max Value: ### ### ### ### ###
© Copyright 2011 Furnace Company

Figure 5-21: Sample Graphical Report Template in Screen Designer

5.5.2 Report Viewer to Preview Reports in Runtime

InstantHMI 6.1 and later support a Report Viewer in Runtime to preview graphical and textual reports before printing. It includes capabilities to select Paper Orientation (Landscape or Portrait).

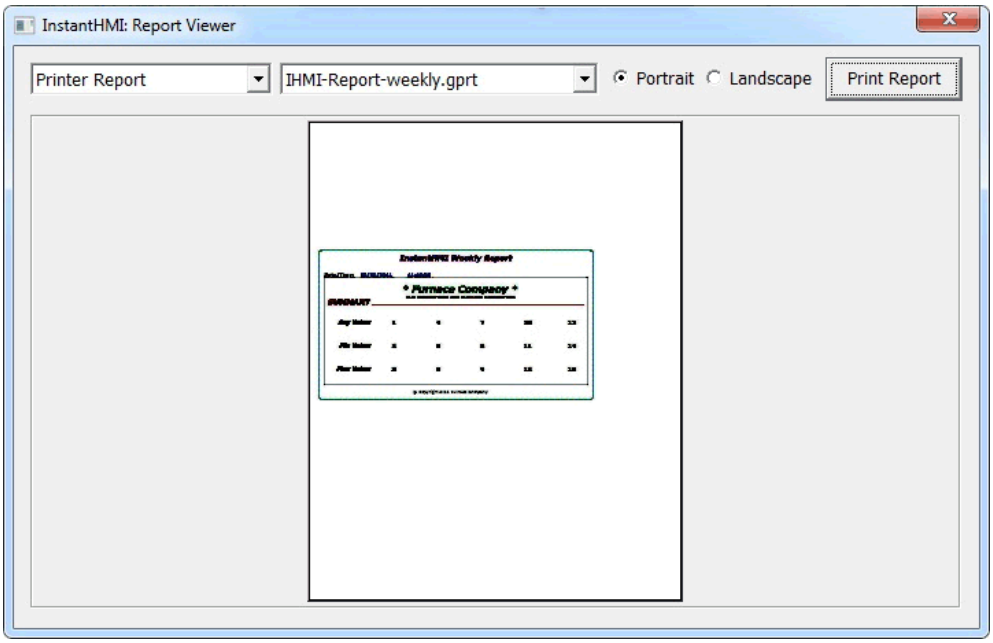


Figure 5-22: Sample Graphical Report Preview in Runtime

5.6 Excel Reporting in InstantHMI

You may use this added feature in InstantHMI Runtime, which uses the built-in spooling mechanism to output (log) data to Excel Report. The implementation steps are described below.

5.6.1 The Implementation Steps

1. Visualize the Excel Output Report

You create a template spreadsheet with "header" rows in Excel. Both .xls and .xlsx files are supported. Note: You MUST name the Range of cells encompassing your Header region to match the Report Name for Excel in Excel Spool Report Template definition (.spx) file. We envision our sample report will look like this.

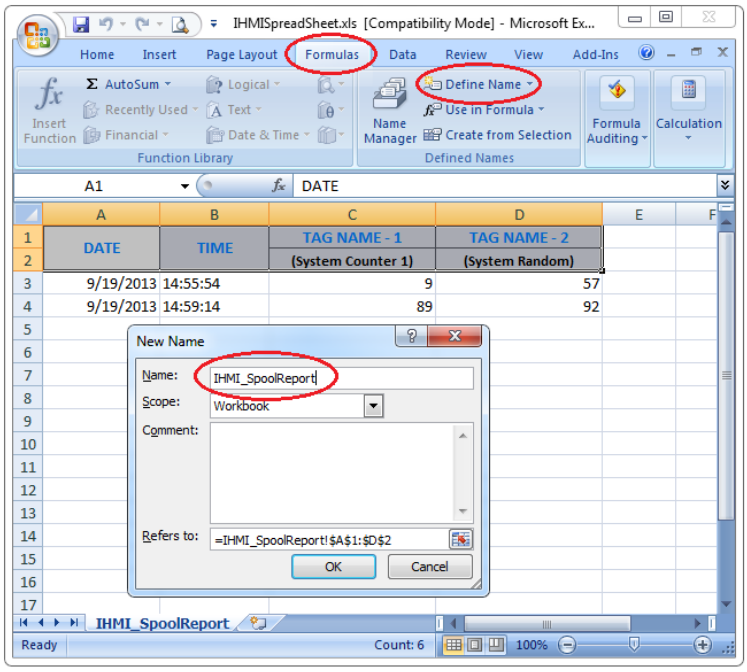


Figure 5-23: IHMI_SpoolReport Named Range

Note that here we have used the first two rows for our Header; Col A 'Date' and Col B 'Time' cells have rows 1 and 2 merged. We have selected the range of cells $A1:$D2 (highlighted in grey) and using the Excel → Formulas → Define Names gave it the name 'IHMI_SpoolReport', which is the report Name. We have named our spreadsheet tab to match the Report Name; you may use any name for your tab. You create the header rows and the Named Range for your report in a similar manner.

When setting up your excel sheet, **each column** in your spreadsheet should be configured with the proper format. To do so in Excel, first select the entire column then click Format -> Cells from the menu, choose the appropriate category and press OK. The Date column should be formatted as Date. Time column should be formatted as Time. Numerical columns should be set to Number format. Once this is done, new data will be output in the correct format from the Runtime.

Note: The Date fields will always contain the date and time internally, how it is displayed/printed is controlled by the cell format selected in Excel (see above, Date format should always be used). This is a feature (limitation?) of the Microsoft Jet driver that is used to write data into Excel. Functionally the end-user should not see a difference.

2. Specify the Excel Report Template

In LaunchPad, click Design → Reports → Excel Report Templates →Excel Report Designer.

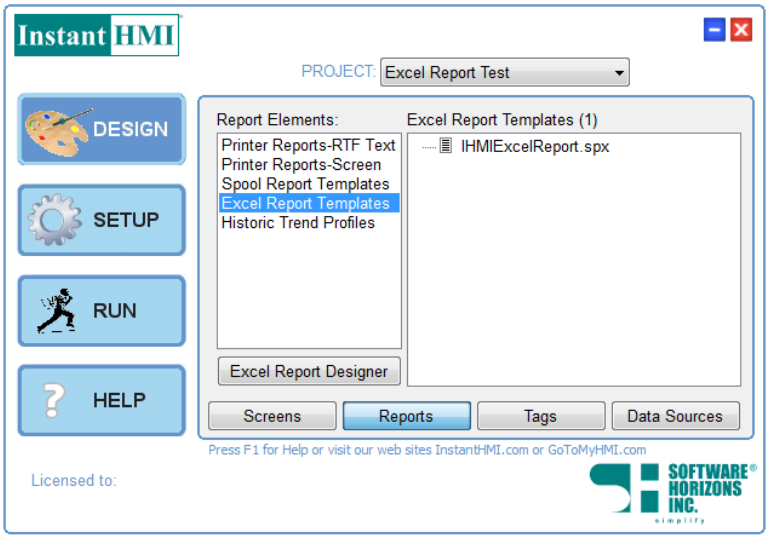


Figure 5-24: Excel SPX Report Template

The Excel Report Designer will pop-up. In our example, it shows the pre-created report template. You may see a different view.

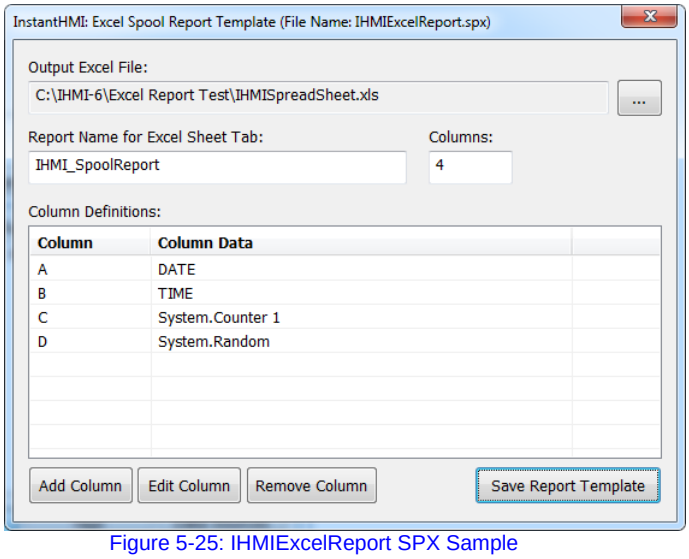


Figure 5-25: IHMIExcelReport SPX Sample

Select/Change output excel file, (which can be anywhere accessible over LAN or external drive from the Runtime PC). Change #of columns to match the number of columns of data that you want your Excel report to contain (this is 4 columns in our case).

Click Add Column or Edit Column if desired to change column definition. In our example, we selected Column C and clicked Edit Column to see the following dialog:

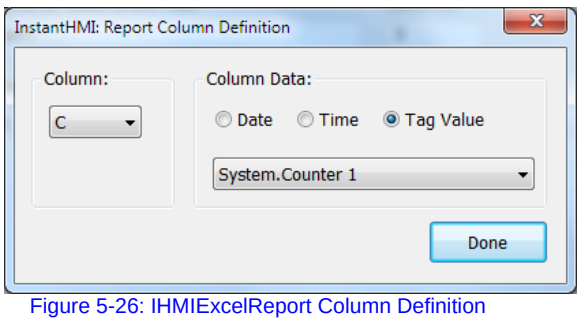


Figure 5-26: IHMIExcelReport Column Definition

After defining columns as required, click Save Report Template. This will save your Excel Report output specifications in the file IHMIExcelReport.spx. This is the file that plays the same role as a spool template file ".spl".

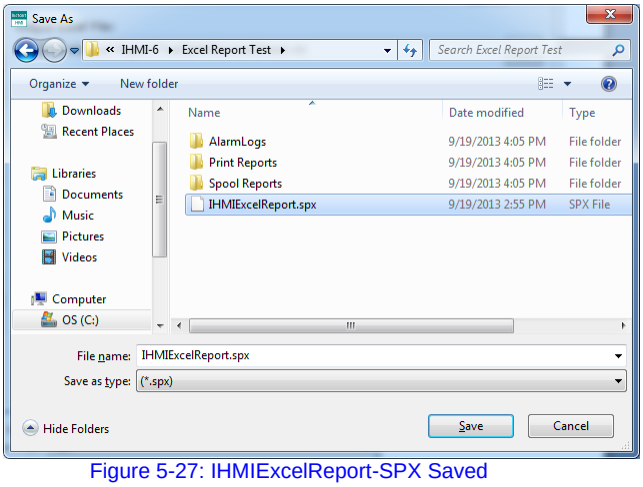


Figure 5-27: IHMIExcelReport-SPX Saved

Our IHMIExcelReport.spx file contains the following setup information.

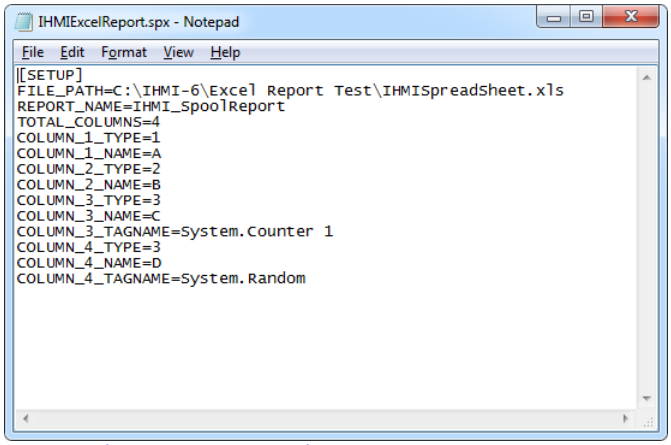


Figure 5-28: IHMIExcelReport-SPX Contents

3. Specify the Spooling Mechanism (similar to spool report)
Three methods are possible for spooling Excel reports:

<u>Spool report by assigning from SETUP → Reports → Spool</u>

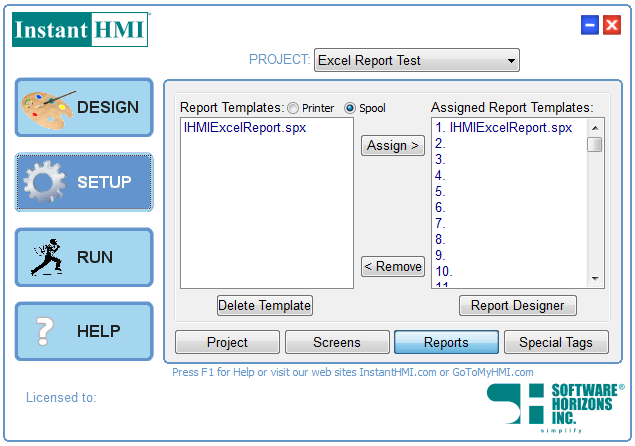


Figure 5-29: IHMIExcelReport-SPX Spool Assignment

The Special (Spool) Register you define may trigger spooling of Data whenever it contains the value 1 (spool # 1 is assigned to IHMIExcelReport.spx in our example).

Spool report using Task Scheduler (DESIGN → Tasks)

The Task you define may periodically spool Data to the excel report (our Example shows 'Every 5 Minutes'.

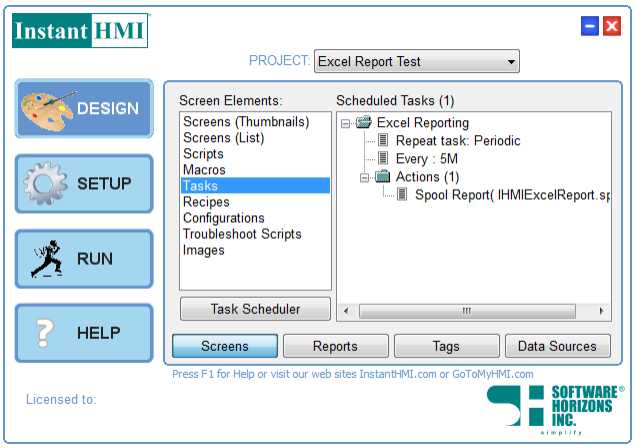


Figure 5-30: IHMIExcelReport-SPX Task Scheduling

Spool report using MACRO

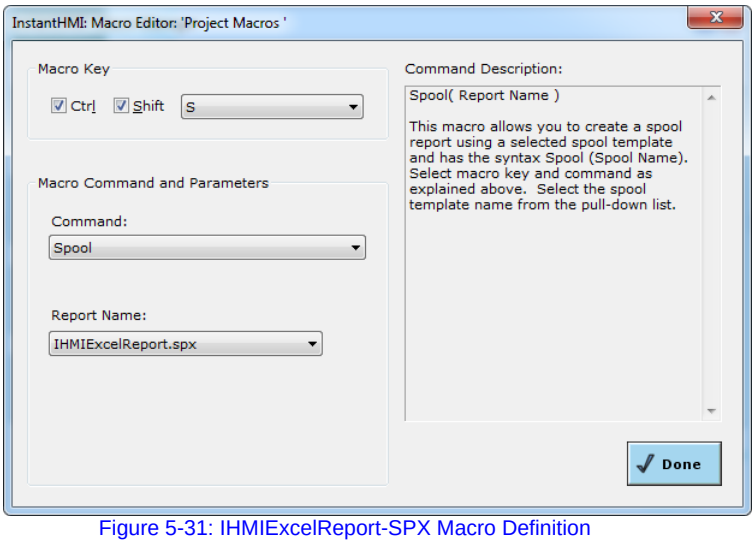

InstantHMI: Macro Editor: 'Project Macros '
Macro Key
Ctrl
Shift
S
Macro Command and Parameters
Command:
Spool
Report Name:
IHMIExcelReport.spx
Command Description:
Spool(Report Name)
This macro allows you to create a spool report using a selected spool template and has the syntax Spool (Spool Name). Select macro key and command as explained above. Select the spool template name from the pull-down list.
Done

Figure 5-31: IHMIExcelReport-SPX Macro Definition

The Macro you define may be assigned to a button to allow on-demand spooling of data to the excel report.

5.6.2 Sample Project and Excel Report Output

This project includes a Sample screen, Excel reporting on-demand (using button labeled 'Spool Excel Report' and also periodic data spooling every 5 minutes using the scheduled task.

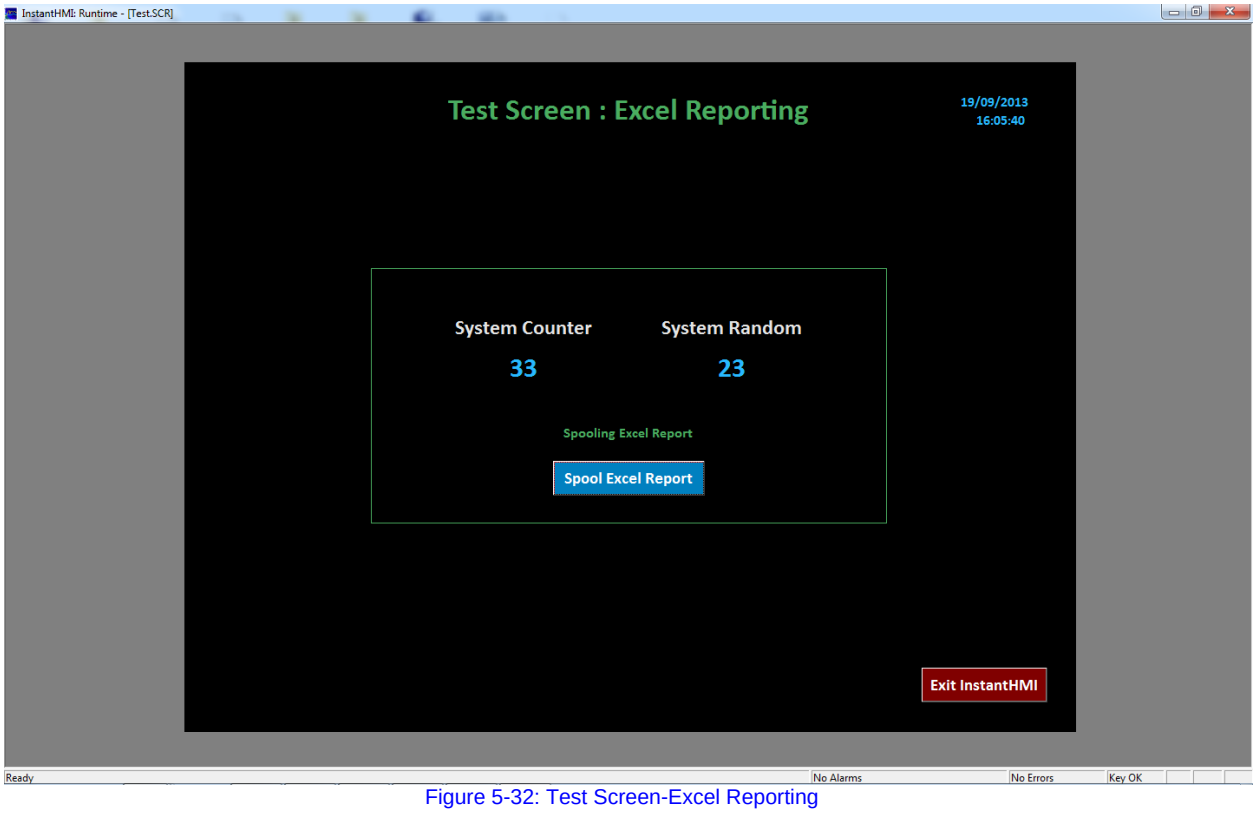


Figure 5-32: Test Screen-Excel Reporting

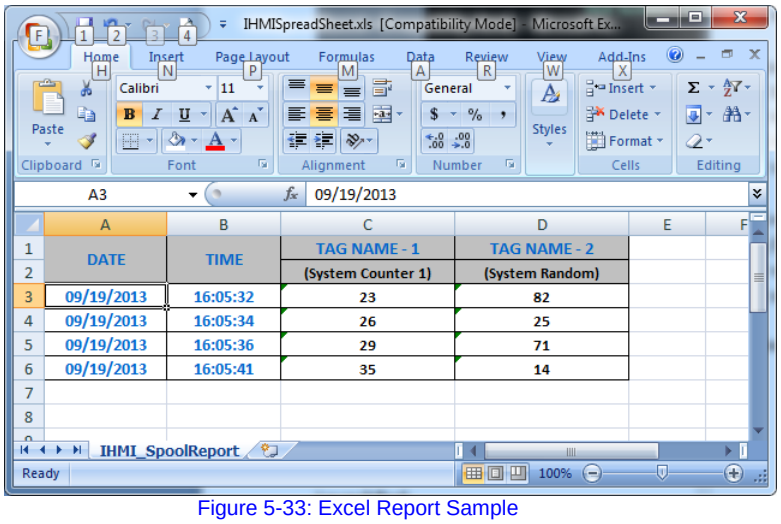


Figure 5-33: Excel Report Sample

5.6.3 Extracting Data from Excel Report for a Custom Report

InstantHMI allows selecting a sub-set of the columns (tags) and a subset of the rows (i.e, 'Start date and time', and 'End date and time') from an existing Excel report and output it to another sheet within that same workbook (.XLS file).

The steps to use this feature are:

1. Gather data into an .XLS file specified in a .SPX Excel Report Template.
2. Create a new macro (see Create_New_Macro.jpg) that points to the desired .SPX file which specifies the Excel file where data will be filtered from.

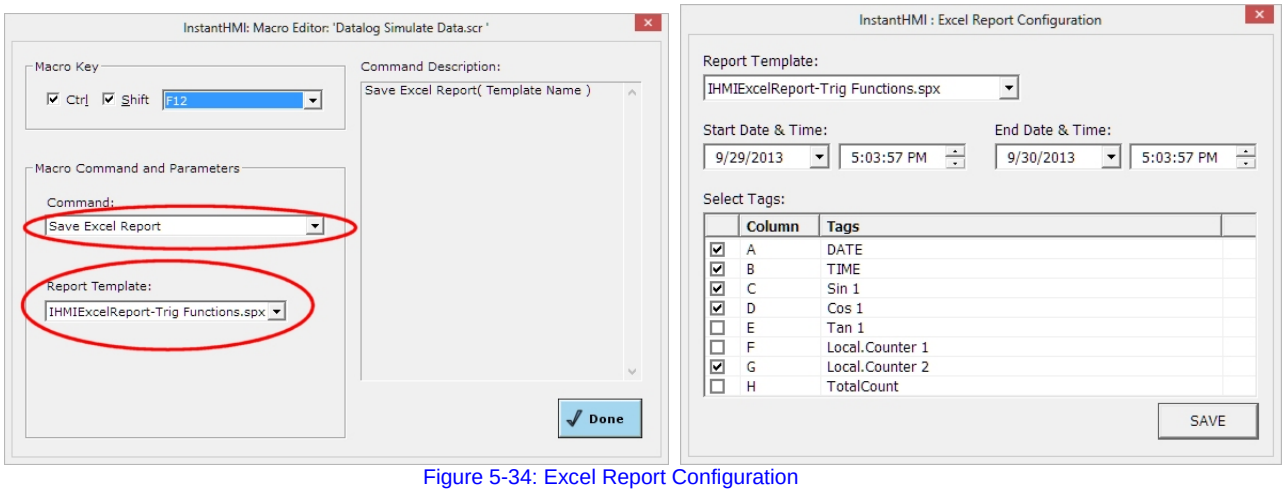


Figure 5-34: Excel Report Configuration

3. Place a macro button on the screen and assign the macro that was created in step 2.
4. In the runtime, click the Macro button and you will see a new dialog appear (see Configure_Report.jpg).
   4a. Select the .SPX file from step 1.
   4b. Set a start and end date for the report.
   4c. Select which tags (columns) you wish to include in your report.
   4d. Click Save.

5. Open the .XLS from step 1. There will be a new sheet, (default is, IHMI_SpoolReport_SubReport or ReportName_SubReport where ReportName is the Report Name specified in the .SPX configuration. This sheet contains the selected data from step 4.

6 Macro Manager

In LaunchPad click on Design → Macros and then click on Macro Manager button. Note: Alternatively, click on LaunchPad → Screens button, and then double click on any screen preview bitmap to run the Screen Designer. Click on Tools → Macro Manager menu to run the Macro Manager.

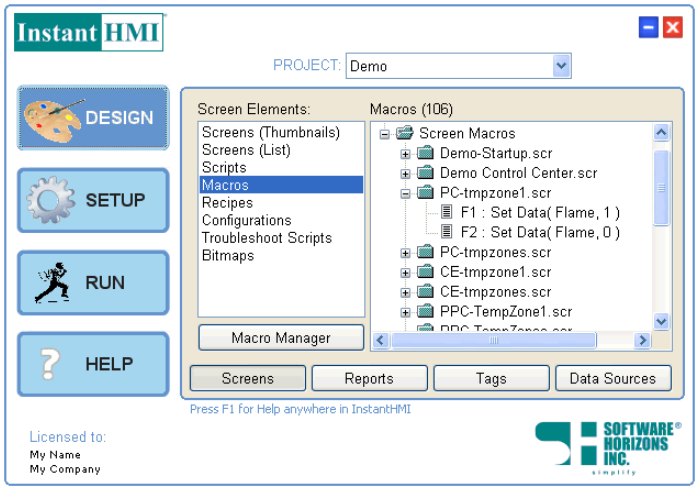


Figure 6-1: Macro Preview and Macro Manager Access in LaunchPad

The operator performs his project tasks by interacting with InstantHMI Runtime Engine through Screen Objects (using Mouse, Touch Screen or other pointing device) and Keyboard keys. The macro button (Section 4.11.4), attached to a macro key and/or providing a 'Switch Screen' functionality, is an easy way to provide operator access to any of the pre-defined system commands (see Section 9.5, Figure 9-17). The Touch Zone object (Section 4.6.5) allows use of more fancy graphical customized buttons for the same purpose. The Macro Manager allows you to define alternative (virtual or real) keys to provide the same functions as the pre-defined commands listed in Figure 6-2. **Note:** Some PDA soft keys and hardware arrow keys may be used to trigger macros.

	COMMAND	PARAMETERS
1	Document Viewer	(DocumentType)
2	Execute Runtime Utility	(Menu Command)
3	Execute Script	(ScriptName)
4	Exit Runtime Engine	(Prompt Option)
5	Open Document	(Document Path and Name)
6	PLC Function	(Flash Write / Run Mode / Stop Mode)
7	Print Report	(ReportName)
8	Print Screen	( )
9	Read Inputs	(ScreenName)
10	Recipe Save	(RecipeName)
11	Recipe Write	(RecipeName)
12	Screen Write	( )
13	Set Data	(ScreenName, TagName, Value)
14	Show Alarms	(Large/Medium/Small)
15	Show Historic Trend	(Tag Group Name, Large/Small)
16	Show Keypad	(TagName)
17	Show Real Time Trend	(Tag Group Name, Large/Small)
18	Spool	(ReportName)
19	Switch Screen	(ScreenName)
20	Wait	(MilliSeccnds)
	SYSTEM KEYS	(See Section 9.5)

Figure 6-2: List of Macro Commands

The Macro Manager has two modes: Macro Viewer (Section 6.1) and Macro Editor (Section 6.2).

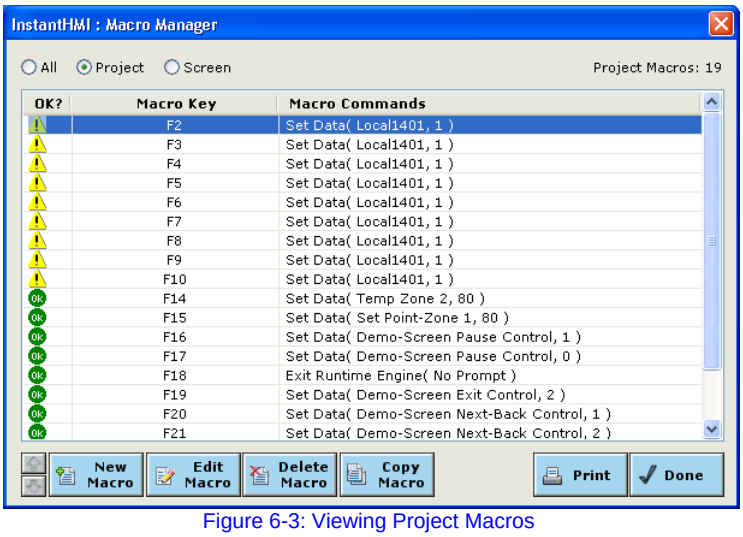
Note: **Contextual help** is available in Macro Manager, Macro Editor, Copy Macro, and Script Editor dialogs.

6.1 Macro Viewer

The database file IHMI-MacroCommandDB.idb stores all macros (Macro Keys, commands and parameters) defined in a project under two groups. '**Project Macros**' group contains global macros

applicable to all screens in the Project. Any global macro may be overridden by a local definition applicable to a specific (current) screen. The macros for specific screens are stored in sub-groups named according to the associated screen names, each of which belongs to the group '**Screen Macros**'. Any keystrokes from the operator at runtime will first be translated using the macro key definitions in the sub-group for the current screen; if no such definition exists then the global macro definition in the 'Project Macros' group in IHMI-MacroDB.idb will be used. When necessary for your convenience, the macro database creates a third group '**All**', which includes macros from 'Project Macros' group and 'Screen Macros' group.

Note: Prior to version 5.1.4 macros were stored differently. The conversion of macros in projects created in an earlier version of InstantHMI to the new database IHMI-MacroDB.idb will happen automatically when you run the LaunchPad version 5.1.4 or later. After conversion, the new screens should no longer be used with earlier version of InstantHMI.


InstantHMI : Macro Manager
All
Project
Screen
Project Macros: 19
OK?
Macro Key
Macro Commands
F2 Set Data(Local1401, 1)
F3 Set Data(Local1401, 1)
F4 Set Data(Local1401, 1)
F5 Set Data(Local1401, 1)
F6 Set Data(Local1401, 1)
F7 Set Data(Local1401, 1)
F8 Set Data(Local1401, 1)
F9 Set Data(Local1401, 1)
F10 Set Data(Local1401, 1)
F14 Set Data(Temp Zone 2, 80)
F15 Set Data(Set Point-Zone 1, 80)
F16 Set Data(Demo-Screen Pause Control, 1)
F17 Set Data(Demo-Screen Pause Control, 0)
F18 Exit Runtime Engine(No Prompt)
F19 Set Data(Demo-Screen Exit Control, 2)
F20 Set Data(Demo-Screen Next-Back Control, 1)
F21 Set Data(Demo-Screen Next-Back Control, 2)
New Macro
Edit Macro
Delete Macro
Copy Macro
Print
Done
Figure 6-3: Viewing Project Macros

The Macro Manager has three radio buttons at the top to allow you to select one of the three groups:

- Project Macros
- Screen Macros (for selected screen)
- All Macros

The list-view displays macros from any selected group (sub-group). The first column in the viewer lists the validation status (OK?) for the macro, the second column lists the Macro Key and the third column lists the associated Macro Command. (For some keys you may see multiple (chained) macro commands to be executed by a single macro key action.)

Note: When viewing 'All' macros a column labeled 'L' appears, which identifies each macro as P(roject) or S(creen).

Six function buttons (MoveUp, Move Down, New/Edit/Delete/Copy Macro) used for editing the macros are enabled when Project or Screen macros are selected. These editing functions (described in Section 6.2) are available if you select Project Group or Screen Group. Click the **Print** button to get a printout of the macros you are viewing. Click on **Done** button to exit the Macro Manager.

6.2 Macro Editor

The macro edit function buttons (MoveUp, Move Down, New/Edit/Delete/Copy Macro) are enabled when Project or Screen macros are selected in the Macro Manager dialog. Click on any displayed macro (Project or Screen) to select it.

6.2.1 Move Up/Down Macro Command

For some macro keys you may see multiple (chained) macro commands to be executed by a single macro key action. The MoveUp, Move Down arrow buttons are enabled only if the selected macro has multiple commands (rows) chained together. Select the command row and click on the Move Up/Down button to reorder the chained commands as desired.

6.2.2 New Macro

Click on the New Macro button to create a new macro. Figure 6-5 shows the New (Project) macro dialog for the Demo Project in the Editor.

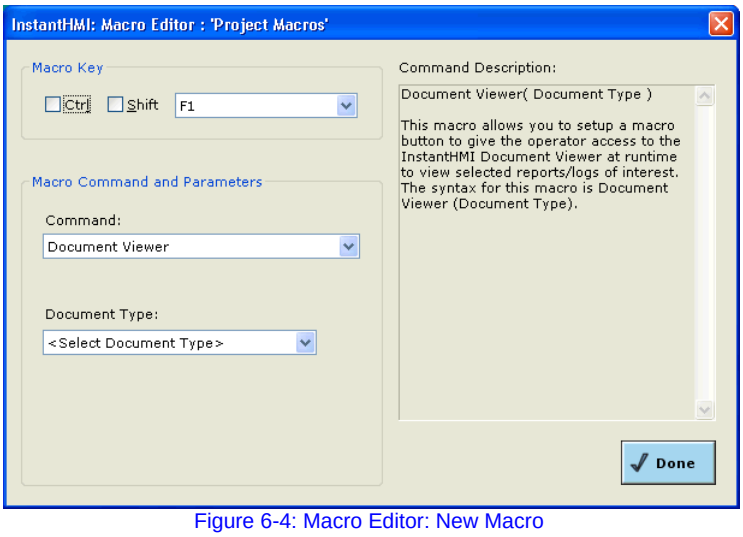

InstantHMI: Macro Editor : 'Project Macros'
Macro Key
Ctrl
Shift
F1
Command Description:
Document Viewer(Document Type)
This macro allows you to setup a macro button to give the operator access to the InstantHMI Document Viewer at runtime to view selected reports/logs of interest. The syntax for this macro is Document Viewer (Document Type).
Macro Command and Parameters
Command:
Document Viewer
Document Type:
<Select Document Type>
Done

Figure 6-4: Macro Editor: New Macro

To completely specify a macro you need to define a Macro Key and a Macro command (including any command Parameters). To define a Macro Key choose one of the key codes from the pull down (Macro Key) list and click on the Ctrl and Shift attribute check boxes if desired. A scrollable list of the available macro commands tabulated in Figure 6-2 is displayed along with the command description for your convenience. Section 6.3 has details for specifying macro commands and associated parameters. Select the desired command and then select or enter the appropriate command parameters.

Note: If the specified macro key definition already exists, the new command will be appended to form a chain of commands. If you need multiple macro commands to be initiated with a single macro key, simply define the appropriate sequence of commands associated with the same macro key. The runtime will execute all the macro functions sequentially as you have defined them. See example in Section 6.4.

When finished, click the Done key to exit the Macro Editor or click on the '**X**' to cancel and return to the Macro Manager dialog.

6.2.3 Edit Macro

Click on the Edit Macro button to edit a selected macro. (You may also double click on a macro to edit it.) Figure 6-5 shows the 'F15' Project Macro for the Demo Project in the Editor dialog.

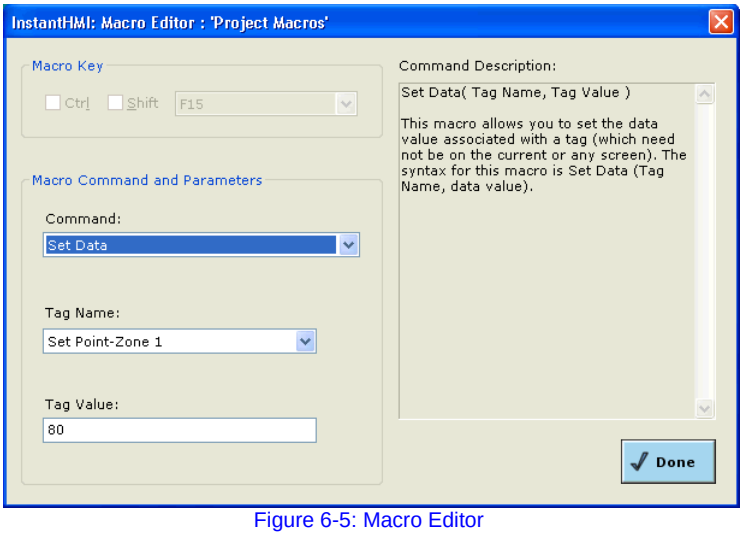

InstantHMI: Macro Editor : 'Project Macros'
Macro Key
Ctrl
Shift
F15
Macro Command and Parameters
Command:
Set Data
Tag Name:
Set Point-Zone 1
Tag Value:
80
Command Description:
Set Data(Tag Name, Tag Value)
This macro allows you to set the data value associated with a tag (which need not be on the current or any screen). The syntax for this macro is Set Data (Tag Name, data value).
Done

Figure 6-5: Macro Editor

Note that the Macro Key field is grayed out; that is, editing an existing macro leaves the macro key as defined previously. Select the desired command and then select or enter the appropriate command parameters. When finished, click the Done key to exit the Macro Editor or click on the '**X**' to cancel and return to the Macro Manager dialog.

6.2.4 Delete Macro

Select a specific (Project or Screen) macro by clicking on it. Use the Delete Macro button to delete the selected macro.

6.2.5 Copy Macro

Use the Copy Macro button to copy (transfer) selected Project macro to a Screen or vice-versa.

To copy a Project macro first select the Project macro group (by clicking on its radio button) and then select a specific Project macro by clicking on it. Now click on the Copy Macro button and in the 'Copy Project Macro to' dialog select the target Screen sub-group.

To copy a Screen macro first select the Screen macro group (by clicking on its radio button) and then select a specific Screen macro by selecting the screen from the pull-down list and then clicking on the specific macro in the viewer. Now click on the Copy Macro button and in the 'Copy Screen Macro to' dialog select the target Project group or another Screen sub-group.

When finished, click the Done key to exit the Copy dialog or click on the '**X**' to cancel and return to the Macro Manager dialog.

6.2.6 Save Macro Database

When you are finished with creating, editing, copying, deleting and re-ordering the macros, and the macro list (Project/Screen Macros) reflects your preferences, then click on the **Done** button. The Macro Manager will save the changes you made to the macro database file IHMI-MacroDB.idb. If you do not wish to save any of the changes you made in this Macro Manager session, then press the Esc key or click on the cancel '**X**' Button.

6.3 Macro Commands

The Macro Editor dialog box has a pull-down list of Macro Commands to help you select the desired command and then enter the appropriate Parameter(s). Refer to Figure 6-2 for a full listing of macro commands. These are discussed in detail below.

1. Document Viewer: This macro allows you to setup a macro button to give the operator access to the InstantHMI Document Viewer at runtime to view selected reports/logs of interest. The syntax for this macro is Document Viewer (Document Type).

Macro Key	Command
<SHIFT> D	Document Viewer (.S01, .S02, …)

For example, this is how you can define a macro key **D** to invoke the Document Viewer to let the operator view all spool files created in the project during runtime. Select the macro key **D**. Now select the command Document Viewer by clicking on it in the commands list box. Select the Parameter Document Type '.S01, .S02, …' from the pull down list that appears. Click on Done button. Note that for upper case **D**, you must click on the Shift check box and then select the **D** key.

Note: To prevent unauthorized access to documents at runtime, the Document Viewer (with integrated text and graphic printing support for all platforms) is accessible only through the Macro function; the project designer may decide to enable operator access.

2. Execute Runtime Utility: This macro has the syntax Execute Runtime Utility (Utility/Tool Name). In conjunction with a macro button, this macro command can enhance the functionality of your runtime screens tremendously. Use a macro button on screen with this macro command to let the operator invoke menu commands (such as Alarm Manager, Config. Manager, Recipe Manager, Alarm & Event Viewer, Troubleshooting Document Viewer, Screen Select) through the screen at runtime (and avoid the need for exposing the runtime menu, Section 9.4).

3. Execute Script: This macro has the syntax Execute Script (Script Name) and causes all statements in the script to be executed. In conjunction with a touchzone, this macro command can enhance the functionality of your runtime screens tremendously.

4. Exit Runtime Engine: When this macro is executed at runtime it will perform the 'Exit Runtime Engine' function with or without 'Prompt' for operator confirmation, chosen by you.

5. Open Document: This macro has the syntax Open Document (Doc Type). In conjunction with a macro button, this macro command is meant to give access to InstantHMI generated reports and logs to the operator through your runtime screens. Use a macro button on screen with this macro command to let the operator invoke the InstantHMI Document Viewer at runtime. The Document Viewer supports only limited number of document types (such as csv, log, rtf). Select macro key and command as explained above. Select the doc type from the pull-down list.

6. PLC Function: This is a restricted macro reserved for use with drivers that support PLC Functions (such as Flash Write / Run Mode / Stop Mode for Yaskawa PLC). Please contact Software Horizons to check if this functionality is available on your runtime platform for your PLC.

7. Print Report: This macro allows you to print a report using the selected report template and has the syntax Print (Report Name). Select macro key and command as explained above. Select the report template name from the pull-down list. Note: Printing capability is included with PC Runtime at no charge, but requires the 'Printing option' to be enabled for CE and PDA platforms.

8. Print Screen: This macro has the syntax Print Screen (Option). When this macro is executed at runtime it will perform the Print Screen function 'Print / Save / Print & Save' depending on the macro option parameter. The saved screen is a bitmap of the screen view. Note: Printing capability is included with PC Runtime at no charge, but requires the 'Printing option' to be enabled for CE and PDA platforms.

9. Read Inputs: (Available only for the PC Runtime)This macro has the syntax Read Inputs (Screen Name) and causes all the data fields with a data type (user) Input on the specified screen (current screen?) to be updated. This macro is useful to 'update all fields' on a screen without requiring them to be constantly monitored. It may be convenient to include a Macro Button (Section 4.11.4) labeled 'Refresh Screen' and attach it to the Read Inputs Macro.

10. Recipe Save: (Available only for the PC Runtime) Use this macro to save the recipe from the controller using the recipe (group) name parameter specified. (Section 3.6 has a discussion of Recipes). This macro has the syntax Recipe Save (Recipe Name). Select macro key and command as explained above. Select the Recipe Name from the pull-down list.

11. Recipe Write: (Available only for the PC Runtime) This macro is similar to the Recipe Save macro. Use this command to transfer a recipe to the controller.

12. Screen Write: This macro may be used to transfer all data entered in input fields on the current screen to the corresponding tag memory locations. It may be convenient to include a Macro Button (Section 4.11.4) labeled 'Write Screen Data' and attach it to the Screen Write Macro.

13. Set Data: This macro allows you to set the data value associated with a tag (which need not be on the current or any screen). The syntax for this macro is Set Data (Tag Name, data value).

Macro Key	Command
<CTRL><SHIFT>INS	Set Data (Tag29, 1)

For example, suppose you want the macro key <Ctrl> <Shift> Insert to set the tag 'Tag29' to the value 1. Select the macro key by clicking on the two check boxes Ctrl and Shift, and select the Insert key from the Macro key list box. Then select the command Set Data, select the tag name Tag29, and enter the value 1. Click on Done.

14. Show Alarms: This macro has the syntax Show Alarms (Size). When this macro is executed at runtime it will pop-up an Alarm Log Viewer object sized as per the macro size parameter (Large/Medium/Small) (See also Section 4.6.7). The operator can view the Alarms and Alarm History, Acknowledge all or selected alarms and dismiss the pop-up Alarm Log Viewer when Done.

15. Show Historic Trend: (Available only for Pocket PC and CE Runtime) This macro has the syntax Show Historic Trend (Tag Group, Plot Size). When this macro is executed at runtime it will pop-up a Historic Trend Viewer sized as per the macro size parameter (Large/Small) and displaying the historic trend of the tags from the 'Tag Group' macro parameter (See also Plot widget in Section 4.11.5).

16. Show Keypad: (Available for PC, Pocket PC and CE Runtime) This macro displays the QuickPad keypad to aid in data entry for the specified tag field.

17. Show Real Time Trend: (Available only for Pocket PC and CE Runtime) This macro has the syntax Show Real Time Trend (Tag Group, Plot Size). When this macro is executed at runtime it will pop-up a Real Time Trend Viewer sized as per the macro size parameter (Large/Medium/Small) and displaying the trend of the tags from the Tag Group macro parameter (See also Plot widget in Section 4.11.5).

18. Spool: This macro allows you to create a spool report using a selected spool template and has the syntax Spool (Spool Name). Select macro key and command as explained above. Select the spool template name from the pull-down list.

19. Switch Screen: This macro allows you to switch to any screen and has the syntax Switch Screen (Screen Name). For convenience, you may choose the reserved screen name ‘Previous Screen’, in which case the macro execution will return return you to previously visited screen at Runtime.

Macro Key	Command
<SHIFT> P	Switch Screen (Training-tmpzone1)

For example, this is how you can define a macro key **P** to switch to screen 'Training-tmpzone1' in our Demo. Select the macro key **P**. Now select the command Switch Screen by clicking on it in the

commands list box. Select the Parameter Screen Name 'Training-tmpzone1' from the pull down list that appears. Click on Done button. Note that for upper case **P**, you must click on the Shift check box and then select the **P** key.

20. Wait: (Available only for PC Runtime) This macro allows you to cause a specified wait period and has the syntax Wait (msec). Select the macro key and command as before and type in the number of milli-seconds in the value field. (This macro is useful in conjunction with other macros; you can ensure that InstantHMI allows enough time for previous command to complete before issuing further commands.)

21. GoToMyHMI Service: (Available only for the PC and CE Runtime) This macro allows control of the GoToMyHMI Web Server. The syntax is GoToMyHMI Service(Service Type). You may 'Start' the web server, 'Allow' and 'Deny' incoming browser connections (when the GoToMyHMI Web Server is running) and 'Exit' the web server.

22. SYSTEM KEYS: (See Section 9.5)

6.4 Macro Example

Figure 6-6 illustrates how you may define the macro key <CTRL> BACKSPACE to toggle a bit (Tag2 definition, not shown here, refers to a bit) using a sequence of three chained macro commands:

Macro Key	Command Sequence
Ctrl + BACKSPACE	SET DATA (Tag2, 1)
Ctrl + BACKSPACE	WAIT (100)
Ctrl + BACKSPACE	SET DATA (Tag2, 0)

Figure 6-6: Macro Command Sequence

To define the command sequence for macro key Ctrl + BACKSPACE, click on the Ctrl check box and select BACKSPACE from the list box. Click on SET DATA under Macro Command, select the tag name (Tag2) from the pull-down list and enter the tag value 1. Click on Done button. Then select the same macro key again to start the second chained command in the sequence; select the command WAIT and enter the value 100 under Command and Parameters. Click on Done button. Select the same macro key a third time and enter the third command. Click on Done button. Review the macro sequence displayed. Click on Done.

The macro database file IHMI-MacrosDB.idb included on your InstantHMI installation contains macros for 'Demo' Project. A partial list of the Demo Project Macros is shown in Figure 6-3.

7 Script Editor

The Runtime Engine enables the operator to perform his project tasks by interacting with InstantHMI through Screen Objects (using Mouse, Touch Screen or some other pointing device) and Keyboard keys. The macro button and Touch Zone objects facilitate operator access to system commands as described in the Macro Editor discussion in Section 6. In addition, you may execute a Script using a Macro. The Runtime Engine processes any script attached to a data field or a macro button or touch zone. The script Startup.sct is executed once when the InstantHMI Runtime Engine starts executing. The script ShutDown.sct is executed once when the InstantHMI Runtime Engine exits its runtime execution state. The script Runtime.sct is executed periodically when the InstantHMI Runtime Engine is executing. Use the Script Editor described in this Section to create, view and edit scripts.

7.1 Getting Started

InstantHMI for Windows includes several tools: Report Designer (Section 5), Macro Editor (Section 6), Script Editor (this Section 7) and Data Source Manager (Section 2.3.5). .All these tools are integrated into the Screen Designer discussed in Section 4. If you have not installed InstantHMI for Windows on your computer do so now (see Appendix A). When installation is complete you should see a program group 'InstantHMI Human Machine Interface' and an icon for InstantHMI LaunchPad. Run InstantHMI LaunchPad and click on Design → Scripts button, and then double click on any script to open the script in the Script Editor. You may also click on Tools → Script Editor menu in Screen Designer to run the Script Editor. (Note: This window is re-sizable. In addition, if you right click in the script edit/viewing field, you may access a menu to 'Select All', Copy, Paste, Delete, etc.)

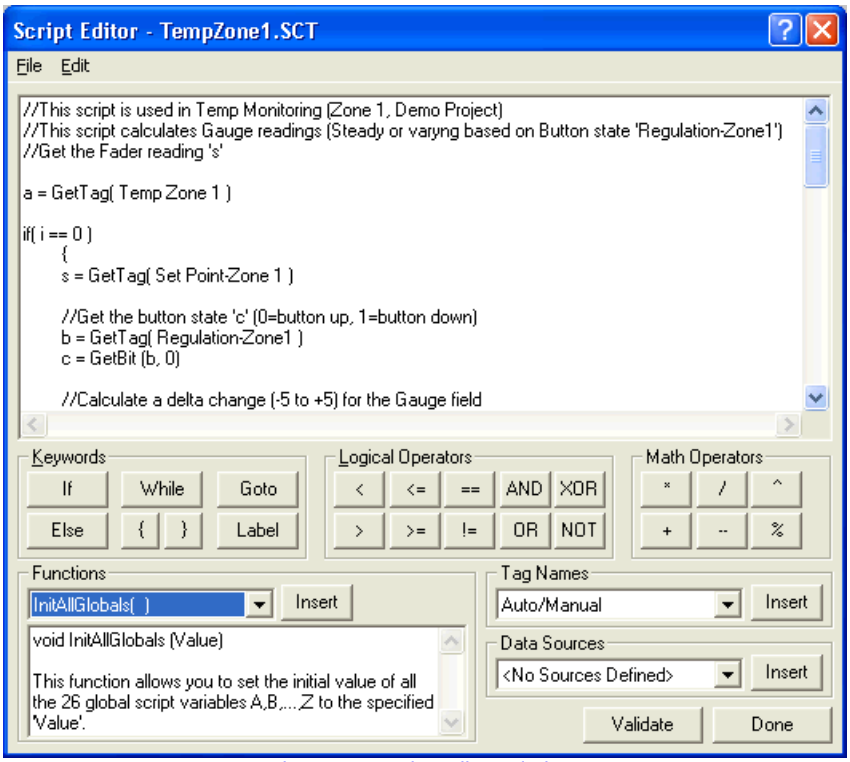

Script Editor - TempZone1.SCT
File Edit
//This script is used in Temp Monitoring (Zone 1, Demo Project)
//This script calculates Gauge readings (Steady or varyng based on Button state 'Regulation-Zone1')
//Get the Fader reading 's'
a = GetTag(Temp Zone 1)
if(i == 0)
{
s = GetTag(Set Point-Zone 1)
//Get the button state 'c' (0=button up, 1=button down)
b = GetTag(Regulation-Zone1)
c = GetBit (b, 0)
//Calculate a delta change (-5 to +5) for the Gauge field
Keywords
If While Goto
Else { } Label
Logical Operators
< <= == AND XOR
> >= != OR NOT
Math Operators
* / ^
+ -- %
Functions
InitAllGlobals( )
Insert
void InitAllGlobals (Value)
This function allows you to set the initial value of all the 26 global script variables A,B,...Z to the specified 'Value'.
Tag Names
Auto/Manual
Insert
Data Sources
<No Sources Defined>
Insert
Validate
Done

Figure 7-1: Script Editor Window

7.2 Script Elements

Your script may contain various source lines, each line containing upto 256 characters. All lines starting with '//' (two slashes) will be treated as comments. A source line may contain Variables, Keywords, Operators, and Functions. Some functions may include Tag Name or Data Source as a parameter. The syntax of different kinds of source lines is discussed in Sections 7.2.1- 7.2.7 below.

Script files are named 'YourFileName.sct' which have a file type (extension) 'sct'. Since script files are saved in binary and contain critical pre-processed information about your script source code, they should only be edited using the InstantHMI script Editor. Use the File → Open command to open any existing script, use the File → New command to create a new script, File → Save command to save the edited script, File → Save As command to save the edited script under a new name, File → Print command to print the script. Three script file names (Startup, Runtime and ShutDown) are reserved. Startup.sct is executed once when the InstantHMI Runtime Engine starts executing. ShutDown.sct is executed once when the InstantHMI Runtime Engine exits its runtime execution state. Runtime.sct is executed once every 'RUNTIME_SCRIPT_SAMPLE_TIME', when the InstantHMI Runtime Engine is executing. This parameter has the default value (1000 msec) initialized in the [IHMIRT] section of the Project.ini file in your Project folder (See Section 2.5.2). Any other script you create may be attached to any monitor data field on any screen in your project. Such a script will be executed when it is time for the Runtime Engine to sample the associated field. Since the Runtime Engine performs other tasks besides script execution, it allocates a percentage of the Sample Time for each script specified by the parameter 'SCRIPT_EXEC_DURATION_PERCENT'. This parameter has the default value (50) initialized in the [IHMIRT] section of the Project.ini file in your Project folder.

```
;These lines are excerpted from Project.ini file

[IHMIRT]
RUNTIME_SCRIPT_SAMPLE_TIME = 1000
SCRIPT_EXEC_DURATION_PERCENT=50
```

You may change it to any value between 10 (%) and 90 (%) to suit your application. Scripts which require longer executing time than allotted (as a % of allocated Sample Time) will continue with their execution at the subsequent sample time(s). Most (short) scripts will finish execution in the allotted time (50% of Sample Time, by default). For longer scripts, the associated Sample Time and the % Script Execution Duration determine the total time needed to finish executing the scripts.

In the script editor text window directly edit the script statements, move the cursor freely to any position in the script. You may directly Append or Insert new source lines, or Edit or Delete an existing source line in your script file.

To Import Scripts from Text files use File → Import and select the text file containing your script source lines, which will then appear in the Script Text editor window. You may then edit, validate and save the script. To Export a Script you have edited in the Script editor to a text file, use File → Export and specify the text file name. (Of course, to Import script source text from a text file you may open it in Windows Notepad, use Edit → Copy to copy selected script lines and in the InstantHMI Script Editor use Edit → Paste to get your script lines in the script text window. Likewise, to export a script to a text file, you may use Edit → Copy the script displayed in the Script Editor text window and paste it into Windows Notepad with ease.)

Use the Edit → Cut, Edit → Copy, and Edit → Paste command to modify selected script lines in the obvious manner.

Although buttons are provided for Keywords, Logical Operators and Math Operators, you may find it more convenient to type them using the corresponding keys on your keyboard. Use the pull-down list of Functions to select a function. Click on **Insert** button to insert Functions and/or Tag Names and/or Data Source in your script. Click on Keywords and/or Operators as required to create your script source lines. Click on **Validate** button to check for syntax and other script errors and save your script. Click on the **Done** button when you are finished creating your script; this will validate your script, save the script if you choose, and return you back to the Screen Designer. If any syntax errors are detected, edit the script to fix the errors.

7.2.1 Variables and Keywords

Starting with version 4.1.2.B2005, you are allowed to use any long variable names for local and global variables. Each variable name must start with a letter (alphabetic character A-Z or a-z) and may contain any number of letters, numbers, period ('.'), and underscore ('_'). You may not use blanks or the minus (-) sign in variable names. Local variables are not shared between scripts. These variables retain their values between executions of the same script. Global variables may be used to transfer parameter values between Scripts. (You were previously restricted to use any of 26 local variables a, b,...,z and any of 26 Global variables A,B,...,Z). The declaration LocalVar (VarName) defines 'VarName' as a local variable. The declaration GlobalVar (VarName) defines 'VarName' as a global variable; we recommend you include all your GlobalVar declarations in the Startup script 'Startup.sct' for your easy reference. Any undeclared variables will be treated as local variables if their name is 2 or more characters long. For backward compatibility (with scripts created using previous version of InstantHMI Script Editor), undeclared single character upper-case variables A, B, …,Z are treated as global variables (declared automatically by the Script Editor). Undeclared single character lower-case variables a, b, …,z are treated as local variables. We recommend you use local vars a, b, …z (with or without declaration) for temporary variables in your script. All variables are of type double but may contain integer, boolean, float or double values.

The keywords (If, Else, While, Goto) and symbols (Label, {, and }) have special syntactical meaning as explained in Section 7.2.7.

7.2.2 Operators

Valid Logical and Math operators are listed below:

Operator	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division
^	Power
( )	Parentheses
%	Modulo
>	Greater than
>=	Greater than or Equal to
<	Less than
<=	Less than or Equal to
==	Equal to
!=	Not Equal to
AND	Logical ‘AND’ (&&)
OR	Logical ‘OR’ (||)
XOR	Exclusive OR
!	Bitwise complement (‘NOT’)

7.2.3 Functions

Valid functions (64 in all) are grouped into nine categories as listed in table below.

Function Category	Script Function	Return Value
ActiveX	ActiveXGetProperty (PropertyName)	double
	ActiveXSetProperty (PropertyName, Value)	void
	ActiveXSetDoVerb (VerbName)	void
	ActiveXSetDoVerbId (VerbId#)	void
Communications	SetDataSoure (DataSourceName)	void
	GetTag (Tag Name)	double
	SetTag (Tag Name, Value)	void
	GetRegisterInt (Address, Bit#, Station#)	double
	SetRegisterInt (Address, Bit#, Station#, Value)	void
	GetByte (Address, Byte, Station#)	double
	SetByte (Address, Byte, Station#, Value)	void
	GetMemory (MemType, Address, Bit#, Station#)	double
	SetMemory (MemType, Address, Bit#, Station#, Value)	Void
Local Memory	GetLocalInt (Address)	double
	GetLocalLong (Address)	double
	GetLocalFloat (Address)	double
	GetLocalDouble (Address)	double
	GetTagBlock (Tag Name, Local Memory Address, Num Adresses)	BOOL
	GetByteFromVar (Source Value, Byte Index)	double
	SetLocalInt (Address,IntValue)	BOOL
	SetLocalLong (Address,LongValue)	BOOL
	SetLocalFloat (Address,FloatValue)	BOOL
	SetLocalDouble (Address,DoubleValue)	BOOL
	SetByteInVar (Source Value, Byte Index, Byte Value)	void
Math/Trig	Asin (Value)	double
	Acos (Value)	double
	Atan (Value)	double
	Sinh (Value)	double
	Cosh (Value)	double
	Tanh (Value)	double
	Sin (Degrees)	double
	Cos (Degrees)	double
	Tan (Degrees)	double
	Sqrt (Number)	double
	ABS (Number)	double
	Log (Number)	double
	Ceiling (Number, Precision)	double
	Floor (Number, Precision)	double
	Round (Number, Precision)	double
Miscellaneous	Beep (Number)	void
	Wait (Msecs)	void
	GetBit (Variable, BitNumber)	BOOL
	SetBit (Variable, BitNumber, BitValue)	Void
	GetLast Error ( )	double
	Execute Macro (Macro Key)	double
Recipe	RecipeLoad (RecipeName)	void
	RecipeSave (RecipeName)	void
	RecipeWrite (RecipeName)	void
Time/Date	GetElapsedTime ( )	double
	GetHour ( )	Int
	GetMinute ( )	Int
	GetSecond ( )	Int
	GetMonth ( )	Int
	GetDay ( )	Int
	GetYear ( )	Int
	GetDayOfWeek ( )	Int
	GlobalVar (VariableName)	void
	InitAllGlobals (Value)	void
	InitAllLocals (Value)	void
	LocalVar (VariableName)	void
GoToMyHMI Service	GTMH_StartWebServer()	void
	GTMH_AllowBrowserConnections()	void
	GTMH_DenyBrowserConnections	void
	GTMH_ExitWebServer()	void

1. ActiveX Functions

Script Function	Return Value
ActiveXGetProperty (PropertyName)	double
ActiveXSetProperty (PropertyName, Value)	void
ActiveXSetDoVerb (VerbName)	void
ActiveXSetDoVerbId (VerbId#)	void

ActiveXGetProperty (PropertyName)
This function returns the value of property 'PropertyName' as a double precision value. To get the native value (int, float etc.) of the property, you may assign the returned value to a Tag with format matching that of 'PropertyName'.

ActiveXSetProperty (PropertyName, Value)
This function sets the value of property 'PropertyName' equal to (double precision) value. To set the native value (int, float etc.) of the property, you may assign the desired value to any script variable and pass that variable as the second argument 'Value'. This function has no return value (‘void’).

ActiveXDoVerb (VerbName)
This function issues the DoVerb (VerbName) request to the ActiveX control associated with the script. This function has no return value (‘void’).

Example:
Assume the following script is attached to a OLE (Wave Sound) 'Sound Recorder Document' object. When the Tag 'PlaySound' has the value 1, this script will cause the Sound Recorder to Play the associated '.wav' file.

```
a = GetTag( PlaySound )
if( a == 1 )
        {
        SetTag( PlaySound, 0 )
        ActiveXDoVerb( Play )
        }
```

ActiveXDoVerbId (VerbId#)
This function behaves exactly like 'ActiveXDoVerb (VerbName)' and issues the DoVerb request (using VerbId corresponding to the VerbName as described in Section 4.6.11) to the ActiveX control associated with the script. This function has no return value (‘void’).

2. Communications Functions

Script Function	Return Value
SetDataSoure (DataSourceName)	void
GetTag (Tag Name)	double
SetTag (Tag Name, Value)	void
GetRegisterInt (Address, Bit#, Station#)	double
SetRegisterInt (Address, Bit#, Station#, Value)	void
GetByte (Address, Byte, Station#)	double
SetByte (Address, Byte, Station#, Value)	void
GetMemory (MemType, Address, Bit#, Station#)	double
SetMemory (MemType, Address, Bit#, Station#, Value)	Void

SetDataSource (Data Source Name)
This function selects the specified Data Source Name from the list of data sources defined for the project for all subsequent communications in the current script. All subsequent script functions (in this script) requiring a data source will use this specified data source.

Example: SetDataSource (ModbusDevice)

GetTag (Tag Name)
This function returns the value of the tag specified by ('Tag Name').

Example: a = GetTag(Local201), where Local201 is a defined tagname.

This example will get the current value of Tag 'Local201' and place the value into variable a.

SetTag (Tag Name, Value)
This function can be used to set the value (specified by 'Value') of the tag specified by ('Tag Name').

Example: a = SetTag(Local201, 100), where Local201 is a defined tag name.

This example will set the current value of tag 'Local201' to a value of 100.

GetRegisterInt (Address, Bit#, Station#)
This function returns the (integer) value stored in the register specified by the four function parameters 'Address' 'Bit#', 'Station#' (see Section 3.3.3). Use the function #3 SetDataSource (Data Source Name) in the script prior to the line calling this function.

SetRegisterInt (Address, Bit#, Station#, Value)
This function can be used to write the 'Value' in the register specified by the by the four function parameters 'Address' 'Bit#', 'Station#' (see Section 3.3.3). Use the function #3 SetDataSource (Data Source Name) in the script prior to the line calling this function.

GetByte (Address, Byte, Station#)
This function can be used to read the value stored in the low byte (Byte=0) or high byte (Byte=1) of the register at specified 'Address', 'Station#'. Use the function #3 SetDataSource (Data Source Name) in the script prior to the line calling this function.

SetByte (Address, Byte, Station#, Value)
This function can be used to set the 'Value' stored in the low byte (Byte=0) or high byte (Byte=1) of the register at specified 'Address', 'Station#'. Use the function #3 SetDataSource (Data Source Name) in the script prior to the line calling this function.

GetMemory (MemType, Address, Bit#, Station#)
This function returns the value stored in 'MemType' location specified by the four function parameters 'Address' 'Bit#', 'Station#' (see Section 3.3.3). Valid definitions of MemType are listed below. Use the function #3 SetDataSource (Data Source Name) in the script prior to the line calling this function.

1 = Register	9 = Input
2 = Bit	10 = Output
3 = PTimer	11 = PCounter
4 = Ctimer	12 = CCounter
6 = Local	17 = Byte

Example: a = GetMemory (1, 100, 0, 1)

This example will get the current value of (Register MemType 1), Address 100, Bit 0, Station 1 from your device and place the value into variable a.

SetMemory (MemType, Address, Bit#, Station#, Value)
This function can be used to write the 'Value' in the 'MemType' location register specified by the by the four function parameters 'Address' 'Bit#', 'Station#' (see Section 3.3.3). See MemType listed under GetMemory().Use the function #3 SetDataSource (Data Source Name) in the script prior to the line calling this function.

Example: SetMemory (1, 100, 0, 1, 200)

This example will set the current value of Register Address 100, Bit 0, Station 1 to a value of 200.

3. Local Memory Functions

Script Function	Return Value
GetLocalInt (Address)	double
GetLocalLong (Address)	double
GetLocalFloat (Address)	double
GetLocalDouble (Address)	double
GetTagBlock (Tag Name, Local Memory Address, Num Adresses)	BOOL
GetByteFromVar (Source Value, Byte Index)	double
SetLocalInt (Address,IntValue)	BOOL
SetLocalLong (Address,LongValue)	BOOL
SetLocalFloat (Address,FloatValue)	BOOL
SetLocalDouble (Address,DoubleValue)	BOOL
SetByteInVar (Source Value, Byte Index, Byte Value)	void

GetLocalInt (Address)

This function returns the integer value in local memory 'Address' specified.

Example: a = GetLocalInt(2500)

In this Example the integer value at Local Address 2500 will be placed into variable 'a'. Note: GetLocalLong, GetLocalFloat and GetLocalDouble have the same syntax and will return a Long, Float or Double value respectively.

GetLocalLong (Address)

This function returns the long integer value stored in two consecutive locations starting with local memory 'Address' specified.

GetLocalFloat (Address)

This function returns the floating point value stored in two consecutive locations starting with local memory 'Address' specified.

GetLocalDouble (Address)

This function returns the double precision value stored in four consecutive locations starting with local memory 'Address' specified.

GetTagBlock (Tag Name, Local Memory Address, Num Addresses)

This function transfers a block of 'Num Addresses' data from the address specified by the 'Tag Name' and transfers it to the block of addresses specified by 'Local Memory Address'.

GetByteFromVar (Source Value, Byte Index)

This function can be used to get a single byte from within a 16 bit or 32 bit value. For 16 bit values ByteIndex must be in the range 0-1, where 0 represents the low byte and 1 represents the high byte. For 32 bit values ByteIndex must be in the range 0-3, where 0 represents the lowest byte and 3 represents the highest byte. This function returns the value of the requested byte from 'SourceValue'.

SetLocalInt (Address,IntValue)

This function sets the value in Local memory 'Address' equal to the 'Int Value' specified. It returns Success '1' or failure '0' as a Bool value.

Example: a = SetLocalInt (2500, 500)

This example will set the current integer value of Local Address 2500 to 500. Note: SetLocalLong, SetLocalFloat and SetLocalDouble have the same syntax and will set a Long, Float or Double value respectively.

SetLocalLong (Address,LongValue)

This function sets the long value in two consecutive addresses starting with Local memory 'Address' equal to the 'Long Value' specified. It returns Success '1' or Failure '0' as a Bool value.

SetLocalFloat (Address,FloatValue)

This function sets the float value in two consecutive addresses starting with Local memory 'Address' equal to the 'Float Value' specified. It returns Success '1' or Failure '0' as a Bool value.

SetLocalDouble (Address,DoubleValue)

This function sets the double value in four consecutive addresses starting with Local memory 'Address' equal to the 'Double Value' specified. It returns Success '1' or Failure '0' as a Bool value.

SetByteInVar (Source Value, Byte Index, Byte Value)

This function can be used to set a single byte within a 16 bit or 32 bit value. For 16 bit values ByteIndex must be in the range 0-1, where 0 represents the low byte and 1 represents the high byte. For 32 bit values ByteIndex must be in the range 0-3, where 0 represents the lowest byte and 3 represents the highest byte. This function returns the new value of the 'SourceValue' with the selected byte set.

4. Math/Trig Functions

Script Function	Return Value
Asin (Value)	double
Acos (Value)	double
Atan (Value)	double
Sinh (Value)	double
Cosh (Value)	double
Tanh (Value)	double
Sin (Degrees)	double
Cos (Degrees)	double
Tan (Degrees)	double
Sqrt (Number)	double
ABS (Number)	double
Log (Number)	double
Ceiling (Number, Precision)	double
Floor (Number, Precision)	double
Round (Number, Precision)	double

Asin (Value)

This is the inverse of the Sine function (#39). If 'Value' is the double precision result returned by Sin('Degrees') then 'degrees' will be returned by ASin ('Value').

Example: a = Asin (0.7660)

This example will return the inverse sine of 0.7660 in degrees. Note: Acos and Atan have the same Syntax.

Acos (Value)

This is the inverse of the Cosine function (#40). If 'Value' is the double precision result returned by Cos ('Degrees') then 'degrees' will be returned by Acos ('Value').

Atan (Value)

This is the inverse of the Tangent function (#41). If 'Value' is the double precision result returned by Tan ('Degrees') then 'degrees' will be returned by Atan ('Value').

Sinh (Value)

This is the hyperbolic Sine function. The argument 'Value' is used in the hyperbolic Sine function to return a double precision value.

Cosh (Value)

This is the hyperbolic Cosine function. The argument 'Value' is used in the hyperbolic Cosine function to return a double precision value.

Tanh (Value)

This is the hyperbolic Tangent function. The argument 'Value' is used in the hyperbolic Tangent function to return a double precision value.

Sin (Degrees)

This function returns the value of Sine function of the 'Degrees' specified as a double precision number.

Example: a = Sin (50)

This example will return the Sine of 50 degrees. Note: Cos, Tan, Sinh, Cosh, Tanh have the same syntax.

Cos (Degrees)

This function returns the value of Cosine function of the 'Degrees' specified as a double precision number.

Tan (Degrees)

This function returns the value of Tangent function of the 'Degrees' specified as a double precision number.

Sqrt (Number)

This function returns the (positive) square root of the 'Number' specified as a double precision value.

Example: a = Sqrt (4096)

This example will return the Square Root of 4096. Note: ABS and Log have the same syntax.

ABS (Number)

This function returns the absolute value of the 'Number' specified.

Log (Number)

This function returns the logarithm of the 'Number' specified.

Ceiling(Number, Significance)

This function rounds 'Number' up, away from zero, to the nearest multiple of significance.

Floor (Number, Significance)

This function rounds 'Number' down, towards zero, to the nearest multiple of significance.

Round (Number, NumDigits, Direction)

This function rounds 'Number' to a specified number of digits 'NumDigits'. Set Direction to -1 to round down, 1 to round up, or 0 to round to nearest whole number.

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5. Miscellaneous Functions

Script Function	Return Value
Beep (Number)	void
Wait (Msecs)	void
GetBit (Variable, BitNumber)	BOOL
SetBit (Variable, BitNumber, BitValue)	Void
GetLast Error ( )	double
Execute Macro (Macro Key)	double

Beep (Number)

This function produces a beep sound on the PC (if sound is not muted). Higher 'Number' produces a longer beep. This function has no return value ('void).

Wait (Msecs)

This function pauses the execution and waits for the specified 'Msecs'. This function has no return value ('void').

GetBit (Variable, BitNumber)

This function returns the boolean bit value in the specified 'Bit Number' position (0,1,...,15) in the specified 'Variable'.

Example: a = GetBit(b, 1)

This example will get Bit Number 1 from variable b and place the result into variable a.

SetBit (Variable, BitNumber, BitValue)

This function sets the 'Bit Number' in 'Variable' equal to the 'Bit Value' (0 or 1).

Example: SetBit(a, 1, 0)

This example will set Bit Number 1 in variable a to 0.

GetLast Error ( )

This function returns the last runtime error encountered during script execution (as per the table in Section 7.4) and resets the error to zero.

Execute Macro (Macro Key)

Just as the macro command Execute Script (Script Name) causes all statements in the script 'Script Name' to be executed, this script function executes the macro command defined for the 'Macro Key'. However, make sure you avoid nested script execution (which is disallowed) as the result is unpredictable.

6. Recipe Functions

Script Function	Return Value
RecipeLoad (RecipeName)	void
RecipeSave (RecipeName)	void
RecipeWrite (RecipeName)	void

RecipeLoad (RecipeName)

Use the Recipe Load function to read the recipe parameters from the controller.

RecipeSave (RecipeName)

You may need Password authorization for this function. The recipe will be saved to the storage medium on the runtime platform.

RecipeWrite (RecipeName)

Use the Recipe Write function to transfer the recipe to the controller.

7. Time/Date Functions

Script Function	Return Value
GetElapsedTime ( )	double
GetHour ( )	Int
GetMinute ( )	Int
GetSecond ( )	Int
GetMonth ( )	Int
GetDay ( )	Int
GetYear ( )	Int
GetDayOfWeek ( )	Int

GetElapsedTime ( )

This function returns the elapsed time as a double precision number of msecs since the execution of InstantHMI runtime started. By using two calls to this function you can determine time intervals precisely.

Example: a = GetElapsedTime()

In this example local variable ‘a’ will be assigned the amount of milliseconds since the InstantHMI Runtime has been started.

GetHour ( )

This function returns the Hour portion of current time as an integer value.

Example: a = GetHour()

In this example local variable ‘a’ will be assigned the integer value of hour.

GetMinute ( )

This function returns the Minute portion of current time as an integer value.

Example: a = GetMinute()

In this example local variable ‘a’ will be assigned the integer value of minute.

GetSecond ( )

This function returns the Second portion of current time as an integer value.

Example: a = GetSecond()

In this example local variable ‘a’ will be assigned the integer value of second.

GetMonth ( )

This function returns the Month portion of current date as an integer value.

Example: a = GetMonth()

In this example local variable ‘a’ will be assigned the integer value of month.

GetDay ( )

This function returns the Day portion of current date as an integer value.

Example: a = GetDay()

In this example local variable ‘a’ will be assigned the integer value of day.

GetYear ( )
This function returns the Year portion of current date as an integer value.

Example: a = GetYear()

In this example local variable ‘a’ will be assigned the integer value of year.

GetDayOfWeek ( )
This function returns the Day of Week for current date as an integer value.

Example: a = GetDayOfWeek()

In this example local variable ‘a’ will be assigned the integer value of day of week.

8. Variable Initialization Functions

Script Function	Return Value
GlobalVar (VariableName)	void
InitAllGlobals (Value)	void
LocalVar (VariableName)	void
InitAllLocals (Value)	void

GlobalVar (VariableName)

Starting with version 4.1.2.B2005, you are allowed to use any long variable names for global variables. (You were previously restricted to use any of 26 global variables A, B,...,Z.) Each variable name must start with a letter (alphabetic character A-Z or a-z) and may contain any number of letters, numbers, period ('.'), and underscore ('_'). You may not use blanks or the minus (-) sign in variable names.

Global variables are shared between scripts. Global variables may be used to transfer parameter values between Scripts because these variables retain their values between executions of any and all scripts. The declaration GlobalVar (VarName) defines 'VarName' as a global (script) variable. This function has no return value (‘void’). All global variables must be declared, otherwise they will be treated as local variables. However, for backward compatibility (with scripts created using previous version of InstantHMI Script Editor), undeclared single character upper-case variables A, B, …,Z are treated as global variables (declared automatically by the Script Editor). We recommend you include all your GlobalVar declarations in the Startup script 'Startup.sct' for your easy reference.

InitAllGlobals (Value)

This function allows you to set the initial value of all the 26 global script variables A,B,...,Z to the specified ‘Value’. This function has no return value (‘void’).

Example: InitAllGlobals (50)

This example will set all global variables (A-Z) to a value of 50. Note: InitAllLocals has the same syntax.

LocalVar (VariableName)

Starting with version 4.1.2.B2005, you are allowed to use any long variable names for local variables. (You were previously restricted to use any of 26 local variables a, b,...,z.) Each variable name must start with a letter (alphabetic character A-Z or a-z) and may contain any number of letters, numbers, period ('.'), and underscore ('_'). You may not use blanks or the minus (-) sign in variable names.

Local variables are not shared between scripts. These variables retain their values between executions of the same script. The declaration LocalVar (VarName) defines 'VarName' as a local (script) variable. This function has no return value (‘void’). Any undeclared variables will be treated as local variables. For backward compatibility (with scripts created using previous version of InstantHMI Script Editor), undeclared single character upper-case variables A, B, …,Z are treated as global variables (declared automatically by the

Script Editor). We recommend you use local vars a, b, …z (with or without declaration) for temporary variables in your script.

InitAllLocals (Value)
This function allows you to set the initial value of all the 26 local script variables a,b,...,z (for the current script) to the specified 'Value'. This function has no return value ('void').

9. GoToMyHMI Service Functions

Starting with version 6.1.28.B4001, you are allowed to use any of the following GoToMyHMI Service functions.

GTMH_StartWebServer ( )
This function will start running the GoToMyHMI Web Server. This function has no return value ('void').

GTMH_AllowBrowserConnections ( )
This function will tell the GoToMyHMI Web Server to allow incoming browser connections. This function has no return value ('void').

GTMH_DenyBrowserConnections ( )
This function will tell the GoToMyHMI Web Server to deny incoming browser connections. This function has no return value ('void').

GTMH_ExitWebServer ( )
This function will exit the GoToMyHMI Web Server. This function has no return value ('void').

7.2.4 Expression

An expression is any valid mathematical expression obtained by combining variables, constants, functions returning a value, and operators.

Example expressions:

```
10.0
Sin (a) + Cos (a) + 0.5
A-5
GetTag (TagName)
GetLocalInt (101)
```

7.2.5 Assignment Statement

The syntax of an assignment statement is simple (variable = expression).

Examples:

```
a = 10
b = Sin (a) + Cos (a) + 0.5
c = A-5
```

7.2.6 Label and Comments

Labels are identified by the prefix ':' (for example, :TAG) and are useful in changing the sequence of execution of the script lines. Note that a statement (even a dummy one such as x=0) must be present on a labeled line.

Any line starting with '//' will be treated as a comment line in your script and will not be executed. Starting with version 4.2 of InstantHMI, you may add in-line comment at the end of your script code line; the rest of the line starting with '//' will be treated as a comment.

7.2.7 Control Statement

Source lines are compiled into code lines and then the script is executed sequentially starting with the first code line. Control statements are useful to alter the sequence of this execution at run time.

InstantHMI script supports control statements involving the following keywords: IF, ELSE, GOTO, WHILE.

Examples control statements:

```
(i)  IF (A > O)
                {
                SetLocalInt (101, 1111)
                }
```
Here if the variable A is greater than zero (i.e. positive) then Local Memory address 101 is set to the integer value 1111.

```
(ii) IF (A > O)
                {
                SetLocalInt (101, 1111)
                }
     ELSE
                {
                SetLocalInt (101, 2222)
                }
```
Here Local 101 is set to the value 1111 if A > O, otherwise it is set to the value 2222.

```
(iii)A = GetLocalInt (101)
     IF (A > O)
                {
                GOTO :Greater
                }
     : LessOrEqual
X = - 1
                GOTO  :END
     : Greater
X = 1
     :END
```
Here if Local 101 is positive X is set to 1, otherwise X is set to -1.

```
(iv)          T = 10
     WHILE (T > 0)
                {
                BEEP (1)
                WAIT (500)
                T = T - 1
                }
```
Here the script will cause 10 short Beeps, with a half second pause between beeps.

7.3 Examples

Example 1: Power Systems

We will illustrate the use of math equations in a script with a simple example from Power Systems involving the calculation of KVA (Kilo Volt Ampere) using KW (Kilo Watt) and KVAR (Kilo Volt Ampere-Reactive) data. Assume the following register and local memory allocations:

Memory	Meaning
R801	KW reading(input to PLC)
L1	computed (KW)2
R803	KVAR reading(input to PLC)
L3	computed (KVAR)2
R806	computed KVA, where (KVA)2 = (KW)2 + (KVAR)2

Figure 7-2: Register Definitions for Power Systems Example

We have used Local Memory for the intermediate results; if these results are needed they may be stored in registers. The script needed for this example is shown in Figure below.

```
a=GetRegisterInt (801)
b=GetRegisterInt (803)
c=a*a
SetLocalInt (1, c)
d=b*b
SetLocalInt (3,d)
e=c+d
e=Sqrt (e)
SetRegisterInt (806, e)
Beep (5)
```

Figure 7-3: Script 1.SCT for Power System Example

We will create a screen with five data fields with the following dataspecs:

- Monitor, Integer, Register, Address 801 (monitor KW)
- Monitor, Local, Address 1
- Monitor, Integer, Register, Address 803(monitor KVAR)
- Monitor, Local, Address 3
- Monitor, Script 1, Register, Address 806

(In Script 1.SCT, compute and store $(KW)^2$ in Local 1, $(KVAR)^2$ in Local3, and KVA in R806)

Example 2: Standard 4-20 mA Signal

Figure 7-4 illustrates a screen used in this example. The fader simulates the 4-20 mA input signal to the PLC converted to a digital value ranging from 2048 - 4095. The gauge displays the calculated (D to A) 4-20 mA signal.

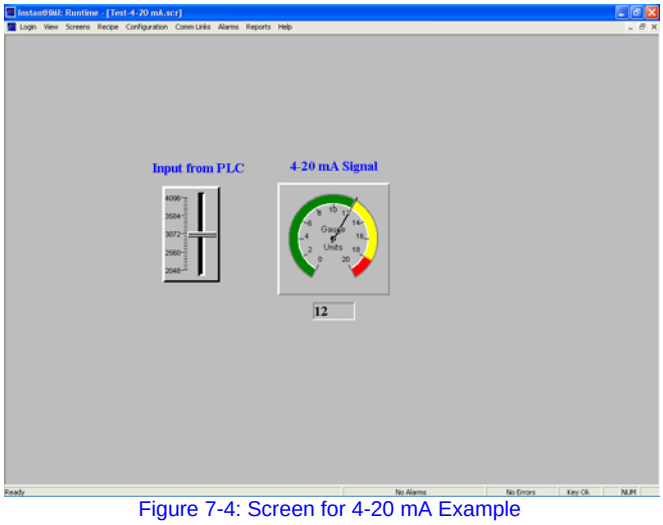


Figure 7-4: Screen for 4-20 mA Example

The dataspecs are listed below.
Input, Fader Widget, Register, Address 101
Properties: Low End Data Value: 2048
High End Data Value:4096
Label Spacing: 10
Monitor, Gauge, Widget, Local, Address: 102
Monitor, Integer, Local, Address: 102, Script 4-20 mA

Note the following register allocations:

Register	Meaning
L101	(Simulated) Analog input signal converted to digital value ranging from 2048 to 4096
L102	Digital value in L101 converted using Script 4-20 mA.SCT back to a 4-20 mA gauge reading

Figure 7-5: Register Definition for 4-20 MA Example

The Script used in this example is shown in the Figure below. Variable Temp1 converts the Analog In A-D digital value to a zero based one ranging from 0 to 2048. The range 2048 corresponds to 20 - 4 = 16 mA. This yields the scaling factor (16 / 2048) and the offset 4 used in the script.

```
//Declare named Local Variables for the script
LocalVar (FirstTime)
LocalVar (Temp1)
LocalVar (Temp2)
LocalVar (AI.Unscaled)
LocalVar (AI.Scaled)

//Check to see if this is the first time running the script
if ( FirstTime == 0 )
  {
  FirstTime = 1
  SetLocalInt( 101, 3072 )
  goto :END
  }
// Get Local 101 (unscaled), subtract 2048 and place result in
Temp1
AI.Unscaled = GetLocalInt( 101 )
Temp1 = ( AI.Unscaled - 2048.0 )
Temp2 = 16.0 / 2048.0

// Do the conversion, place result in AI.Scaled
AI.Scaled = ( Temp1 * Temp2 ) + 4.0

// Set the result in local 102
SetLocalInt( 102, AI.Scaled )
:END
```

Figure 7-6: Script '4-20 mA.SCT' for 4-20 mA Example

Example 3: Ramp and Soak

This example illustrates how a script can be used for implementing a ramp and soak scheme. To keep the example simple a simulation approach is used and the control details are eliminated.

For convenience of operator data entry, a screen is setup for entering the ramp and soak profile. (Different profiles could be setup before hand as recipes to be selected, but that approach is not illustrated here).

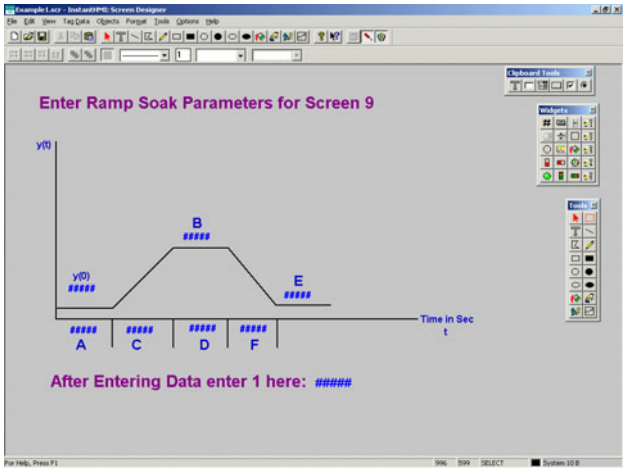


Figure 7-7: Ramp Soak Profile Data Entry Screen

```
// Ramp Soak --- Uses Temp Zones Screen in Demo Project
//Ramp Soak -- Uses TempZones Screen
//Assumes initial value of z=0

LocalVar(Stage)
LocalVar(SetPoint.Low)
LocalVar(SetPoint.High)
LocalVar(RampRate.Heat)
LocalVar(RampRate.Cool)
LocalVar(Temperature)
LocalVar(Duration.Soak1)
LocalVar(Duration.Ramp1)
LocalVar(Duration.Soak2)
LocalVar(Duration.Ramp2)

if( z == 0 )
   {
   //Not setup yet. Initialize Ramp-Soak parameters
   z = 1
   Temperature.Start = 20
   Duration.Soak1 = 10
   SetPoint.High = 80
   Duration.Ramp1 = 15
   Duration.Soak2 = 20
   SetPoint.Low = 10
   Duration.Ramp2 = 10
   u = GetElapsedTime ()
   SetTag( Temp Zone 4, Temperature.Start )
   Stage = 0
   goto :END
   }

if (Stage == 0)
   {
   goto :SOAK1
   }
if (Stage == 1)
       {
       goto :RAMP1
        }
if (Stage == 2)
        {
        goto :SOAK2
        }
if (Stage == 3)
        {
        goto :RAMP2
        }

goto :END

:SOAK1
t = GetElapsedTime ()
t = (t - u) / 1000
if ( t <= Duration.Soak1 )
   {
```

```
    // Do nothing. Just Soak.
    SetTag( Temp Zone 4, Temperature.Start )
    goto :END
    }
else
    {
            Stage = 1
            RampRate.Heat =  (SetPoint.High - Temperature.Start) / Duration.Ramp1
            goto :END
            }

:RAMP1
t = GetElapsedTime ()
t = (t - u) / 1000
Temperature = GetTag( Temp Zone 4 )
Temperature = Temperature + RampRate.Heat
if( Temperature > SetPoint.High )
    {
    Temperature = SetPoint.High
    }

SetTag( Temp Zone 4, Temperature )

if ( t <= (Duration.Soak1 + Duration.Ramp1) )
    {
    goto :END
    }
else
    {
    Stage = 2
    goto :SOAK2
    }

:SOAK2
t=GetElapsedTime ()
t=(t-u)/1000
if( t <= (Duration.Soak1 + Duration.Ramp1 + Duration.Soak2) )
    {
    // Do nothing. Just Soak.
    goto :END
    }
else
    {
            Stage = 3
            RampRate.Cool =  (SetPoint.Low - SetPoint.High) / Duration.Ramp2
            Temperature = GetTag( Temp Zone 4 )
    goto :END
            }
:RAMP2
t=GetElapsedTime ()
t = (t - u) / 1000
Temperature = Temperature + RampRate.Cool
if( Temperature < Temperature.Start )
    {
    Temperature = Temperature.Start
    }
```

```
SetTag( Temp Zone 4, Temperature )
if( t <= (Duration.Soak1 + Duration.Ramp1 + Duration.Soak2 + Duration.Ramp2) )
   {
   goto :END
   }
else
            {
            Stage = 0
   Temperature.Start = 20
            u = GetElapsedTime ()
            }

:END
```

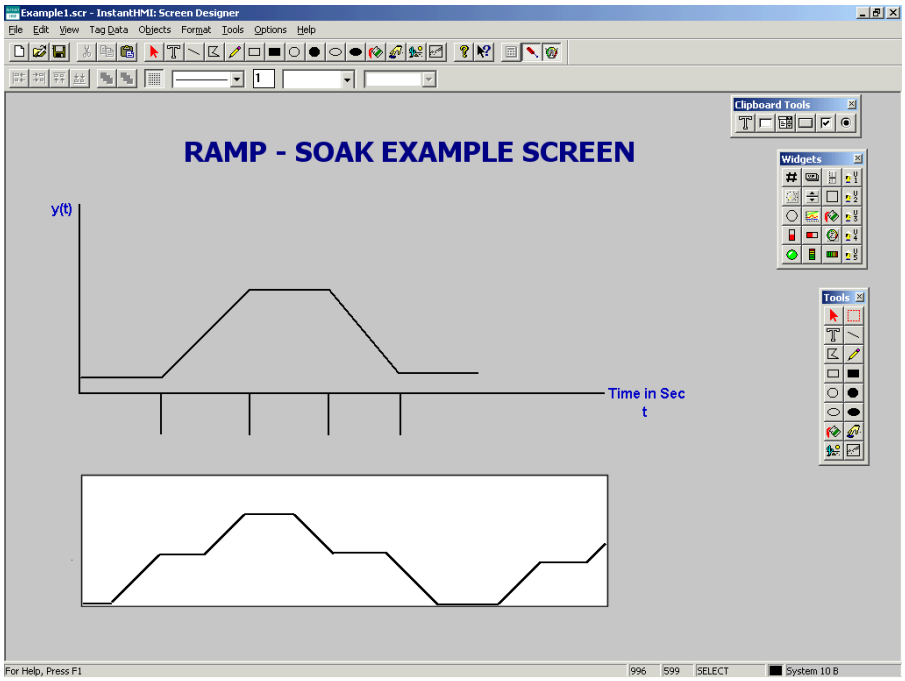


Figure 7-8: Ramp Soak Trend Screen

7.4 Error Messages

The table in Figure 7-9 lists the error messages you might encounter during script execution.

Error	Description
1001	Error in executing GetLocalInt function
1002	Error in executing GetLocalLong function
1003	Error in executing GetLocalFloat function
1004	Error in executing GetLocalDouble function
1005	Error in executing SetLocalInt function
1006	Error in executing SetLocalLong function
1007	Error in executing SetLocalFloat function
1008	Error in executing SetLocalDouble function
1009	Error in executing GetField function
1010	Error in executing SetField function
1011	Error in executing GetRegister function
1012	Attempt at division by zero error
1013	Error in executing GetByte function
1014	Error in executing SetByte function
1015	Error in executing GetMemory function
1016	Error in executing SetMemory function
1017	Error in executing SetRegister function
1018	Unsupported function called
1019	No ActiveX Control associated with script
1020	ActiveX Control Property name does not exist or is read-only
1021	ActiveX Control Dispatch not implemented
1022	ActiveX Control verb not supported

Figure 7-9: List of Error Messages for Script Editor

8 Communication Interface

InstantHMI provides various options to connect your Runtime Engine platform to the machine / process controllers. The communication links supported include:

- Wired Serial Cable (Section 8.3) or TCP/IP Ethernet (Section 11)
- Wireless IR (Section 8.4)
- Wireless RF (Section 8.5)

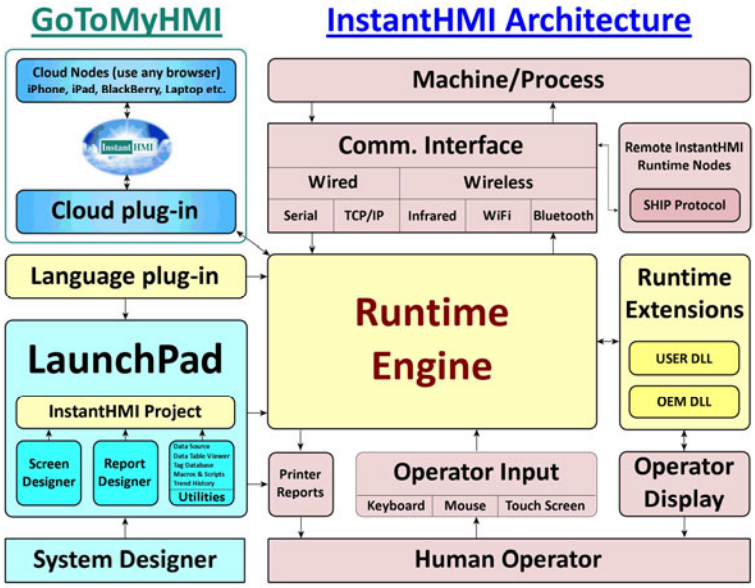


Figure 8-1: InstantHMI Architecture

8.1 InstantHMI Communication Manager

In order to take full advantage of the multi-core processors on PC hardware we have re-architected (version 6.1.29 or later) the InstantHMI Communication Manager (CommMgr), which is responsible for the implementation of the Comm Interface. It performs all communications in a streamlined and efficient manner, and also allows multiple data sources and multiple channels to be used simultaneously. That is, communications in each channel will proceed in parallel and no channel will block another.

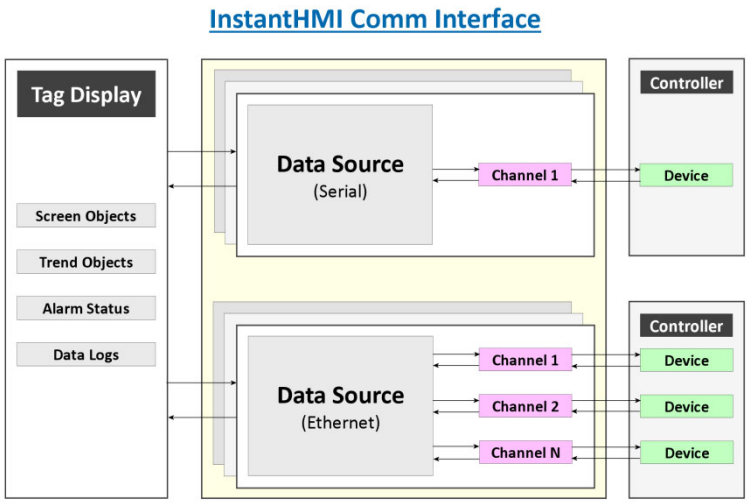


Figure 8-2: Comm Manager Implementation of InstantHMI Comm Interface

Multi-Core and Multi-threaded Architectural Considerations

Vast majority of computers can't multitask (in the strict sense of the word), all they can do is task switch. Windows supports preemptive multitasking. Cooperative multitasking was used by Windows OS prior to Windows 95 and Windows NT. Systems with more than one processor open the door to true multitasking, with two or more tasks running literally at the same time.

A core is the part of a microprocessor that does all the computing and is only able to handle one task at a time. Until recently, newer microprocessors were being clocked faster and existing applications ran faster. Modern chip architecture is designed to accommodate multi-cores on a single chip. The benefit of a multi-core system is that the microprocessor can handle multiple threads simultaneously. Power consumption, heat, and their effects on clock speeds are a major factor in pushing the industry towards multi-core technology. It's likely that the dual-core chips will always be clocked slower than a single-core.

A program running on a computer is technically known as a process. Each process has its own memory context. A *thread* is the basic unit to which the OS assigns processor time. When a process has more than one thread, all of the threads have access to the process's memory context.

When applications for desktop or notebook PCs aren't written with threading in mind (and are designed to run in the foreground) trouble ensues when an application doesn't "play well with others." A single badly written application can hog the CPU.

On a single-core system, the OS handles task scheduling, giving both the UI and send/receive threads some attention, but neither can run at the same time. In a multi-core system, the scheduler can let both run at the same time—or if network conditions slow, it can put a wait on the send/receive threads without affecting the UI threads at all. The result is an application that's more effective and more satisfying.

It is a lot easier to add a second CPU to a computer than it is to make one CPU twice as fast! The system could have a dozen CPUs, and a single-threaded program would still not take advantage of them.

InstantHMI Communication Manager is designed to parallelize at the task layer since that seems to be the best way to go. The architecture logically separates different tasks into different threads.

Some challenges arise at the conceptual or design level. If a programmer wants to use multi-threading on a multi-processor system to truly increase performance, it is necessary to break a time-consuming task into two or more parts that can each be assigned to its own thread. Because these threads will be executing at the same time, each on its own processor, they need to be largely independent of each other, although not necessarily completely independent. Simply put, Thread A cannot be dependent on the results of Thread B to carry out its actions, and *vice versa*. The key to avoiding trouble is always the same: minimize data coupling.

For example, suppose that at some point during its execution Thread A changes the variable X, and at some point during its execution Thread B reads the variable X. The overall outcome will differ depending on whether Thread B reads variable X before or after Thread A changes it. Programmers must use various thread synchronization techniques to prevent such race conditions from invalidating their program's results.

If your application is not multi-threaded, it will not show any performance improvement with multi-core, other than the side effects you get from background processing such as downloading file, or printing. The only way to make the most of a Dual-Core AMD Opteron, or any future multi-core processor, is going to be to build in concurrency at the application level.

The cardinal rule of all performance programming, including concurrent programming, is that you must be guided by objective measures of performance.

Note: This section is based on the articles in AMD's 'Surviving and Thriving in a Multi-Core World'.

8.1.1 Organization of Polled Tags

The CommMgr will receive from the Runtime all the tags that need to be polled. The CommMgr will organize these tags into three groups:

- Permanent Tags,
- Intermittent Tags, and
- On Demand Tags.

The Permanent Tags group, which will be polled 'continuously' at their respective sample times, includes four sub-groups:

- Alarm Tags,
- Datalog tags,
- Trend Tags, and
- Special Register tags.

The Intermittent Tags group, which will be polled only if the runtime state dictates that they should be polled, includes three sub-groups:

- All Screen tags,
- SHIP Clients, and
- User DLL tags (Note: this need not be included for prior runtime implementations)

The On Demand Tags group, which will be polled whenever tags are added to this group, will take precedence over other groups. Once a tag is added to this group and the communication completes, the tag will be removed from this group. Tags belonging to this group include ten sub-groups:

- User Input from the Runtime,
- Macros,
- Scripts,
- Recipes and Configurations,
- Datalog Triggers,
- Task Scheduler Event tags,
- Report (Printer, Spool and Excel) tags
- User DLL communications,
- Web Browser Clients, and
- SHIP Clients.

8.1.2 Polling Mechanism

The polling will allow only one open transaction per channel, but multiple (all) channels can have open transactions simultaneously. The polling will service each channel in turn and determine if there is an open transaction. The communication driver will be called to try and finish any open transaction for the channel being serviced. If no transaction is open the channel will start the next transaction and the polling will advance to the next channel. When a channel transaction is complete, the Update Thread will be notified that new data is available from the channel. The objects that will be updated by the Update Thread include:

- Screen Objects (and object images for Web Browser nodes)
- Trend Objects,
- Alarm Status,
- Data logs (ODBC, MySQL, etc.),
- Output Reports (csv, Printer, Spool, Excel)

8.1.3 Runtime States

The Runtime detects following state changes:

- Runtime Screen is changed, and/or
- Web Browser screen is changed, and/or
- SHIP Screen is changed, and/or
- the UserDLL removes tags from the CommMgr.

The Runtime will notify the CommMgr of any change in state so that the CommMgr can update the Active Comm List for each channel and re-configure the Communication Objects to match the new Runtime state.

8.1.4 Performance Metrics

Performance metrics to assess the Communication Manager will be tabulated as shown below:

Performance Metric	Channel 1	Channel 2	Channel x	Channel N	All Channels
Successful Transactions					
Current Transaction Time					
Maximum Transaction Time					
Timed-out Transactions					
Other Failed Transactions					

8.1.5 Setup Parameters for Comm Manager

Add following parameters in Project.ini file [Setup] section:

```
[SETUP]
USE_COMM_MGR=1
USE_HIGH_RES_TIMER=1
COMM_MGR_SLEEP_TIME=1000
CHANNEL_COMM_MGR_SLEEP_TIME=1000
COMM04_SLEEP_TIME=1000
COMM53_SLEEP_TIME=1000
COMM62_SLEEP_TIME=1000
ENABLE_TRANSACTION_STATISTICS=1
```

USE_COMM_MGR=1, enables Runtime to use CommMgr (0=disable). This parameter is provided for backward compatibility and should be left at value 1.

USE_HIGH_RES_TIMER=1, enables Runtime clock to use high resolution timer (0=disable). This parameter should be left at value 1.

COMM_MGR_SLEEP_TIME=1000, Fractional sleep time of Comm Mgr Data Source Thread ('Channel Processing Loop'). This parameter should be left at value 1000 (micro-seconds); it may be internally over-ridden by the Comm Manager based on channel transaction time.

CHANNEL_COMM_MGR_SLEEP_TIME=5000, Fractional sleep time of Comm Mgr Channel Polling Thread ('Comm Object Processing Loop'). This parameter should be left at value 1000 (micro-seconds); it may be internally over-ridden by the Comm Manager based on channel transaction time.

ENABLE_TRANSACTION_STATISTICS=1, enables the Transaction Statistics. This will generate Transaction counts over recent past time intervals (5 sec, 10 sec, 30 sec, 60 sec) which are stored in the Local memory addresses tabulated below. Note that Local Memory in the range 9000-9999 are reserved for internal use. They may be used only for the purposes designated in InstantHMI documentation.

Data Source	5 Sec	10 Sec	30 Sec	60 Sec	Remarks
DS0	L9122	L9124	L9126	L9128	Local Memory Loop
DS1	L9222	L9224	L9226	L9228	User Data Source A
DS2	L9322	L9324	L9326	L9328	User Data Source B

8.1.6 Test Results

Test PC was a Dell Laptop with Intel Core 2 Duo CPU T8100@2.10GHz, 4GB Ram, Windows 7 64-bit OS. The project included three screens: **80 Fields - Modbus TCP, 80 Fields – Koyo, 40 Fields Modbus TCP + 40 Fields Koyo.**

That is, two Data Sources DS1 (Modbus TCP PLC simulation on Dell) and DS2 (Koyo PLC accessed over Ethernet LAN or Internet using ECOM driver), in addition to the Local Memory Data

Source (DS0). Data object sample times were set to **1 msec** to make the communication task as demanding as possible and then assess the actual performance capabilities.

The Table shows the effect of Modbus PLC communication response latency (delay) on number of transactions using the Response Time of 0, 1, 2, and 5 msec. The result is as expected: 1240 transactions in 10 sec (or 8 msec per transaction including the 5 msec response delay), which is roughly half the transactions for 1 msec response delay and one-third the transactions for 0 msec delay.

Modbus Simulation Response Time (msec)	CM Sleep Time Microsec	CH Sleep Time Microsec	Driver Multi Read?	80 Fields - Modbus TCP (Same PC)			80 Fields – Koyo (Over Internet)			40 Fields - Modbus TCP (Same PC) 40 Fields – Koyo (Over Internet)			
				Local Trans	Modbus Trans	PC CPU % (Approx)	Local Trans	Koyo Trans	PC CPU % (Approx)	Local Trans	Modbus Trans	Koyo Trans	PC CPU % (Approx)
				10 Sec	10 Sec		10 Sec	10 Sec		10 Sec	10 Sec	10 Sec	
0	1000	1000	No	16630	3566	15	16600	420*	5	16500	3450	412*	25
1	1000	1000	No	16400	2522	15	16600	419*	5	16600	2512	414*	25
2	1000	1000	No	16600	2006	15	16600	412*	5	16600	2000	387*	20
5	1000	1000	No	16600	1240	15	16600	415*	5	16600	1240	415*	15
5	1000	1000	No	16600	1240	15	16600	1980**	5	16600	1240	1980**	15

*** Internet, ** LAN**

In fact, the results in the table above indicate that Modbus comm. processing time per transaction is a mere 3 msec (+ PLC response delay). Similarly, we would expect that Koyo transaction time would also be about 3 msec (+PLC response delay). The Koyo response delay was measured to be 3-10 msec over LAN and much longer over the Internet. The results for these tests are also shown in the Table above. We shall use the (more realistic) 5 msec Modbus response delay for further testing.

Note that we have included a column showing CPU % usage. It is important for well behaved programs 'not to hog' the CPU. To enhance this behavior, we have included two 'sleep times': Comm Manager Sleep Time and Channel Sleep time. A Channel sleep time of 1000 microseconds means that the channel processing loop will sleep (1 clock time) every 1000 microseconds and will sleep (0) at other times, that is, let Windows OS assign processing time to other tasks of equal priority. Note that for 'nifty response' we have provided a parameter 'USE_HIGH_RES_TIMER=1', which makes the clock tick every msec. The Table below shows the effect of increasing the (time interval between) sleep time.

CM Sleep Time Microsec	CH Sleep Time Microsec	Driver Multi Read?	80 Fields - Modbus TCP (Same PC)			80 Fields – Koyo (Over Internet)			40 Fields - Modbus TCP (Same PC) 40 Fields – Koyo (Over Internet)			
			Local Trans	Modbus Trans	PC CPU % (Approx)	Local Trans	Koyo Trans	PC CPU % (Approx)	Local Trans	Modbus Trans	Koyo Trans	PC CPU % (Approx)
			10 Sec	10 Sec		10 Sec	10 Sec		10 Sec	10 Sec	10 Sec	
1000	1000	No	16600	1240	15	16600	415	5	16600	1240	415	15
1000	5000	No	16600	1240	10	16600	425	5	16600	1230	415	15
1000	50000	No	16600	1380	10	16600	430	5	16600	1380	425	15

Modbus Simulation Response Time for this table is 5msec, matching the last row in the previous table. Only the Channel Sleep Time is varied.

In conclusion, we recommend using the default parameter based on what we have discussed above, that is, CM Sleep Time= 1000, CH Sleep Time= 1000. If you have the time and the need to do your own testing, follow the steps we have outlined above.

8.1.7 Comm Error Logs

Comm errors are logged in two csv files which can be conveniently viewed in Microsoft Excel:

1. IHMI-CommErrorsLog.csv
   This file has a header record describing each Data Source (DS ID) and its associated Channels (CH ID). Every comm. error for any of the channels is listed in a table with column headings: 'Date,Time,Error Code,DS ID,CH ID,Tag Name'

2. IHMI-CommStatusLog.csv
   This file has a header record describing each Data Source and a table with column headings: 'Data Source ID,Date,Start Time,End Time,Total Comms,Total Errors,Timeout Errors,General Errors'. Comm status is logged every five minutes in this file.

8.2 RS-232 Signal Assignments

Legacy controllers and devices may have RS-232 DB-25 connectors. For your convenience the signal assignments for the usual DB-9 connectors and the corresponding DB-25 assignments are listed in the table below.

9 Pin	Function	25 Pin
1	Received Line Signal Detect	8
2	Received Data	3
3	Transmit Data	2
4	Data Terminal Ready	20
5	Signal Ground	7
6	Data Set Ready	6
7	Request to Send	4
8	Clear to Send	5
9	Ring Indicator	22

8.3 RS-232/RS-485 Serial Link using Cables

Different controllers require different cable connections. The cable connections are described in the driver appendix for your controller included in section C.

8.4 IR Link using Infrared Kit

Kit Contents

Pocket PC

Item A: Infrared Converter Adapter in Orange or Yellow color (Figure 8-3).
Item B: IR Adapter w/ Power Supply - Black Box with InstantHMI Label (Figure 8-3).

.

Note: If you are using a Pocket PC 2002 PDA (example: Compaq Ipaq 3800 series) for Infrared to function properly you may need to do the following:

- Tap Start → Settings
- Tap Connections tab.
- Tap Beam Icon.
- Uncheck the box "Receive all incoming beams" and select discoverable mode.

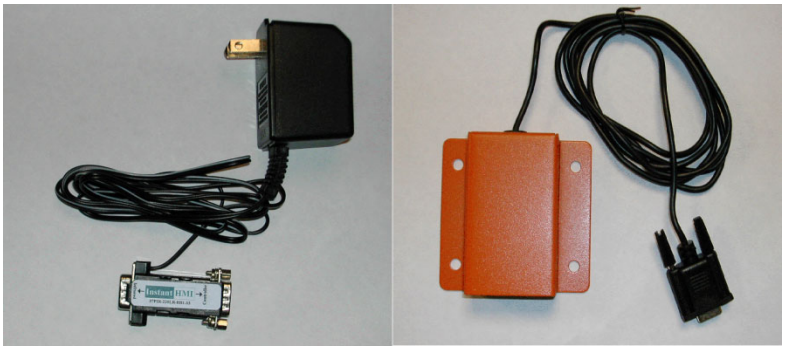


Figure 8-3: Infrared Converter and IR Adapter with Power Supply

Instructions

Infrared communications in the IR-Kit is fixed at 9600 baud. Your controller and InstantHMI must be configured to use 9600 baud to ensure proper communications.

Step 1. Connect the end labeled "To Infrared" on your InstantHMI IR Adapter (item B) to the infrared Converter Adapter (item A).

Step 2. Connect the end labeled "To Controller" on your InstantHMI IR Adapter (item B) to the PLC cable end (that usually goes to PC).

Step 3. After checking all connections carefully Plug in the power supply (Software Horizons Part# 37PIR-220LR-xx) to a 110V AC outlet.

Step 4. Beam the Pocket PC IR port at the IR adapter connected to the PLC (from 4" to a maximum of about 6 to 10 feet away from the IR adapter). This range depends on many factors. For the IR-Link to function properly, the IR beam from the Pocket PC to the IR adapter should have a clear 'cone of sight', just like a TV remote controller (Figure 8-4).

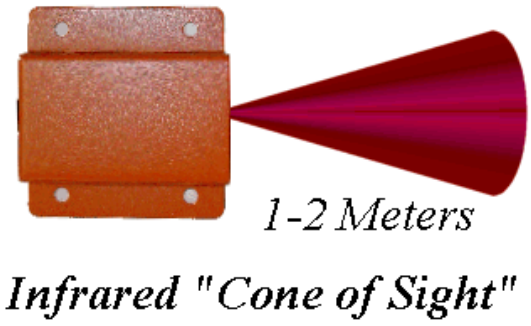


Figure 8-4: IR 30° Cone of Sight

8.5 RF-Link using RF-Kit

Kit Contents

Item A: (1) Wireless Access Point
Item B: (1) Compact Flash Wireless Network Adapter
Item C: (1) 10 Mbit Ethernet Hub (4-Port Standard)
Item D: (4) 14ft RJ-45 Ethernet Cables
Item E: (1) 5ft RJ-45 Crossover Cable

We provide several RF kits to suit your PLC configuration(s). Some RF Kits do not include an Ethernet Hub (item C) or 4 Ethernet cables (item D). Instead, these kits come with a single RJ-45 "crossover" cable (item E) that connects directly your Controller to your Access point.

You must have a PC with a working Network Interface Adapter (10Mbit, RJ-45 type) to configure the RF-Kit. The PC must be configured to use the TCP/IP Protocol and initially needs to have an IP Address in the 192.168.0.XXX range (this may be changed later). Please ensure that no devices have duplicate IP Addresses, as this will cause network problems.

The RF-Kit from Software Horizons, provided for your convenience, is pre-tested for correct functionality. Software Horizons provides only limited support for configuration of your wireless network and devices. Please read and follow the product manuals for help with your configuration. For assistance with these products, please contact the manufacturer.

Overview

The Wireless Access Point (AP) is required for wireless access to your network. The AP has a usual range of 100 meters indoors and 300 meters outdoors. Any wireless device you are using must be well within this range for RF communications to work properly.

Default Configuration

Access Point (Item A):
Your Wireless Access Point is configured for the address 192.168.0.200. You can change this address by using the configuration software that comes with your Access Point.

CF Wireless Adapter (Item B):
If you purchased a PDA from Software Horizons with your RF Kit, your Compact Flash Wireless Network Adapter is configured for the address 192.168.0.201. You can change this address from your PDA with the configuration utility that comes with the adapter.

We recommend using the RF-Kit as a standalone network not connected to any other network. If you wish to connect your Wireless RF-Kit to an existing network, please contact your Network Administrator and/or the Manufacturer of the product for assistance in configuring your equipment.

Controller Configuration:
Your Controller must have an available Ethernet port to connect to the Wireless RF Kit. The Controller must be configured to use an IP address in the 192.168.0.XXX range in order to function properly if you are using the Controller with our pre-configured Wireless Kit.

Instructions:

Step 1: Connect a 14ft Ethernet cable (Item D) from the first port (1) on the Hub (Item C) to the Access Point (Item A).

Step 2: Connect another 14ft Ethernet cable from the second port on the Hub (Item C) to your Controller's Ethernet Port (10 Mbit).

Step 3: Connect power to the Ethernet Hub.

Step 4: Connect power to your Controller.

Step 5: Connect power to your Access Point.

Step 6: Insert the Compact Flash Wireless Network Adapter (Item B) into your Pocket PC's Compact Flash slot and turn the Pocket PC on.

8.6 RF-Link using Bluetooth Kit

Kit Contents

Item A: (1) Serial-Bluetooth Adapter
Item B: (1) Serial Cable to controller from Adapter (if necessary)
Item C: (1) Bluetooth equipped PDA with InstantHMI Runtime Engine

The BT-Kit from Software Horizons, provided for your convenience, is pre-tested for correct functionality. Software Horizons provides only limited support for configuration of your wireless devices. Please read and follow the product manuals for help with your configuration. For assistance with these products, please contact the manufacturer.

Controller Configuration:
Your Controller must have an available serial port to connect to the Wireless BT Kit.

Example Setup

Test Equipment Used:
1 - HP iPAQ 2490 Pocket PC
1 - 3e Technologies 3e-250 Serial to Bluetooth Adapter, or
1 - Socket Cordless Serial Adapter
1 - Modbus Compatible PLC
1 - InstantHMI Pocket PC Runtime 4.0.26 or later

Step 1A. 3e-250 Adapter Setup
(If you are using Socket CSA adapter go to Step 1B.)
The 3e-250 Bluetooth to Serial adapter was configured for **9600, No Parity, 8 Data Bits and 1 Stop Bit** to match PLC communication settings. Configure your adapter appropriately to match your PLC/Controller communication setup. The 3E-250 has DIP Switches that control how CTS and DTR are handled. During testing the CTS and DTR Dip Switches were set in the **ON** position. Depending on your PLC/Controller, these dip switches may need to be set differently or an adapter (Null modem, Gender Changer or other) may be necessary.

Step 1B. Socket Cordless Serial Adapter (CSA) Specific Controller RTS/CTS Signals
(If you are using 3e-250 adapter skip Step 1B.)

The Socket CSA uses standard RS-232 signaling and requires a RTS/CTS signal to be present. If your Controller/PLC does not supply the RTS/CTS signals, the cable used to connect the Controller to the Socket CSA needs to have Pins 7 and 8 (assuming a DB9 connector) jumpered on the Bluetooth end of the cable.

If your controller only provides Tx/Rx and Ground signals (Pins 2, 3 and 5), jumpering of the RTS/CTS lines is required for proper communication.

Step 2. Pocket PC Setup
2a. Before configuring the Pocket PC, ensure the Bluetooth device you are trying to communicate with is properly configured and powered **ON**.

On the iPAQ, open the **Bluetooth Manager** (this can be found on the Pocket PC Start Menu, tap the iPAQ Wireless icon). Ensure the Bluetooth radio is ON. Under the Bluetooth section, tap the **Manager** button. Tap New, then scroll down to **Explore a Bluetooth device** and tap the icon, this will open the **Bluetooth Connection Wizard**. You should see your Bluetooth device appear in this screen, tap the device icon. The Pocket PC will search the available services on your bluetooth device and any available services will appear in the **Service Selection** box. Select the service you want (typically the service is labeled Serial Port or similar), then tap Next and Finish.

By default, Authorization required and Authentication (Passkey) Required are turned on in the Bluetooth Settings on the PDA. To communicate with the Socket CSA (using its default settings), you should uncheck both of these options. You CAN use the authentication/authorization settings but they need to match on the PDA and the Socket CSA. We recommend keeping these off for testing purposes however.

2b. Close the Bluetooth Manager by tapping the **X** in the upper-right of the screen. This will bring you back to the iPAQ Wireless screen. Under the Bluetooth section, tap the **Settings** button. Tap the **Services** button to view Bluetooth services available on your iPAQ. In the **Services** box, tap **Serial Port**, then tap **Advanced**. Note down which **COM Port** is assigned to **Outbound COM Port**, this is the COM Port that you will use with InstantHMI in the next step (COM8 was used during testing).

Step 3. InstantHMI Software Setup

Start InstantHMI on your Pocket PC. Tap **Setup** then **Comm Setup.** In the Comm Setup screen, tap the Edit button next to the Data Source Name field to edit your existing Data Source or to Create a new one. On the Data Source Manager screen, tap **Add New** if you do not have an existing Data Source or **Edit**, to modify your current source. In the Data Source Editor, change **Comm Link to Bluetooth**, change the **Port** to the port found in **Step 2b (Outbound COM Port).** These are the only Bluetooth Specific changes that are needed in InstantHMI - **Comm Link** and **Port.**

Technical Note on using InstantHMI Bluetooth Port Manager

(When available, we recommend you use the utility that came with your PDA for managing the port instead of the InstantHMI Bluetooth Port Manager.)

The InstantHMI Bluetooth Port Manager allows the association of a virtual communication port with a bluetooth slave device (for InstantHMI driver communications) for PDA's that don't include an utility for managing the port association (Example: Bartec MC9000).

To enable the InstantHMI Bluetooth Port Manager on your PDA, from the InstantHMI Main Menu, click 'Setup'->'Comm Setup'. If you have not yet created a Data Source click 'Add New' to create a new Data Source. If your Data Source already exists select the Data Source and click 'Edit'. Select 'Bluetooth' from the 'Comm Link' dropdown list and then select 'Legacy Setup…' from the 'Port' dropdown list. Note: If 'Legacy Setup…' is not shown in the 'Port' dropdown list you may contact Software Horizons to enable this feature.

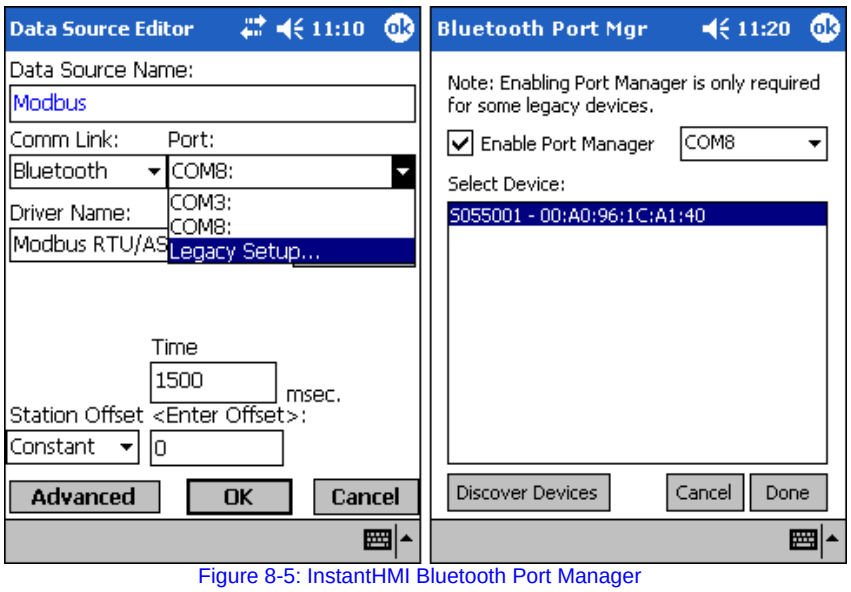


Figure 8-5: InstantHMI Bluetooth Port Manager

In the InstantHMI Bluetooth Port Manager check the 'Enable Port Manager' box. You then can select one of the available communication ports listed. After setting up the InstantHMI Bluetooth Port Manager you must select the corresponding communication port in the Data Source Editor Port list. To select the bluetooth device you want to communicate with, click the 'Discover Devices'

button (this process may take 30–60 seconds). Select the device you want to communicate with and click 'Done'. At this point you have successfully created a virtual communication port association with a bluetooth device. The port association can be changed to any other bluetooth device by repeating this procedure.

8.7 Modem Communication Link

If your InstantHMI installation includes the modem interface option, the following steps will help you configure the modem communication link in InstantHMI Runtime to access PLCs at a remote site.

Note: You should seek the help of some competent person to properly setup modems for the Local and Remote Sites. See Section 8.7.2 for Trouble shooting tips. The discussion here involves the low cost Hayes Modem Accura v.92. Although you should be able to use any Hayes compatible modem in a manner similar to that described here, you are responsible for understanding and establishing a modem link using appropriate cables, jumper settings, telephone connection etc. If you need assistance please contact Software Horizons for a quote on applicable charges.

Step 1: Initialize Remote Site modem using Modem Initialization Strings
Using Windows Hyper-Terminal or Modem Properties setup in Windows Device Manager, for each remote site modem, enter any required Modem Initialization Strings. An example for a 'Hayes Modem Accura v.92' is shown the 'Text Box' below.

Hayes Modem ACCURA v.92

1. Initialization String
AT&FS0=1&C0&D0&K0L0M0V0X0

Setting Explanations:
&F - Factory Settings
S0=1 - Auto-answer after 1 Ring
&C0 - 0 RLSD is always ON. (Receive Line Signal Detect)
&D0 - 0 Modem ignores DTR.
&K0 - 0 Disables flow control (&K4 for XON/XOFF)
L0 - Volume Off, (1 for default)
M0 - Speaker Off (1 for default)
V0 - Numeric Result Codes (V1 for ASCII String Responses).
X0 - Only display CONNECT message, no baud rate specified once connected to remote modem

2. Save Config to NVRAM of modem
AT&W&W1

This ensures that the settings are retained after a reset.

3. Other Misc Settings - NOT USED
+IFC: 0,0 and +IFC: 2,2 are defaults
+IPR=0 (0, 2400, 4800, 9600, 19200, 38400, 57600, or 115200)
If unspecified or set to 0, automatic detection is selected and the character format is also forced to autodetect.
+ICF=0.

Here the string "AT&FS0=1&C0&D0&K0L0M0V0X0" sets Auto Answer after one ring, etc. Your remote site modem(s) must have the capability to retain the setting in non-volatile memory so any power interruptions do not require you to reset the remote modem again. The string 'AT&W&W1' will save modem config to NVRAM of the remote modem. Once the remote modems are configured correctly, they are ready for use in the remote site(s) with appropriate cabling to the PLC.

Step 2: Design Data Source for Modem Comm Link

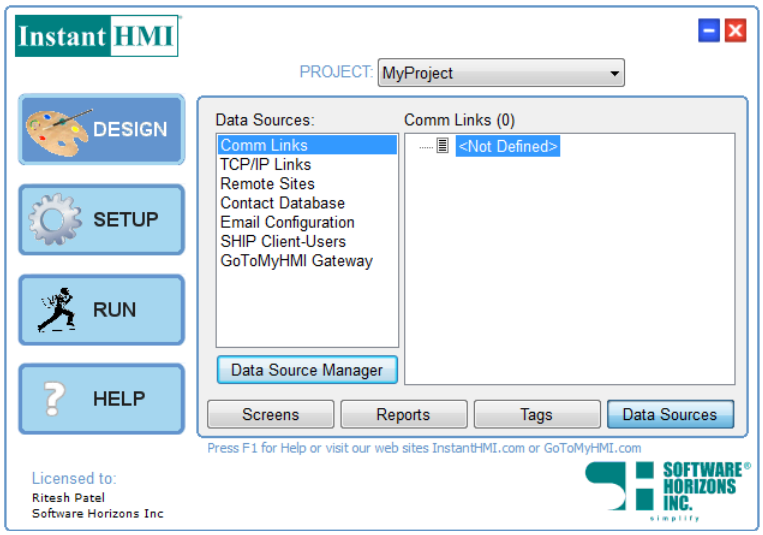


Figure 8-6: Data Source for Modem Comm Link

Click on LaunchPad → Design → Data Sources and select Comm Links. Click on Data Source Manager.

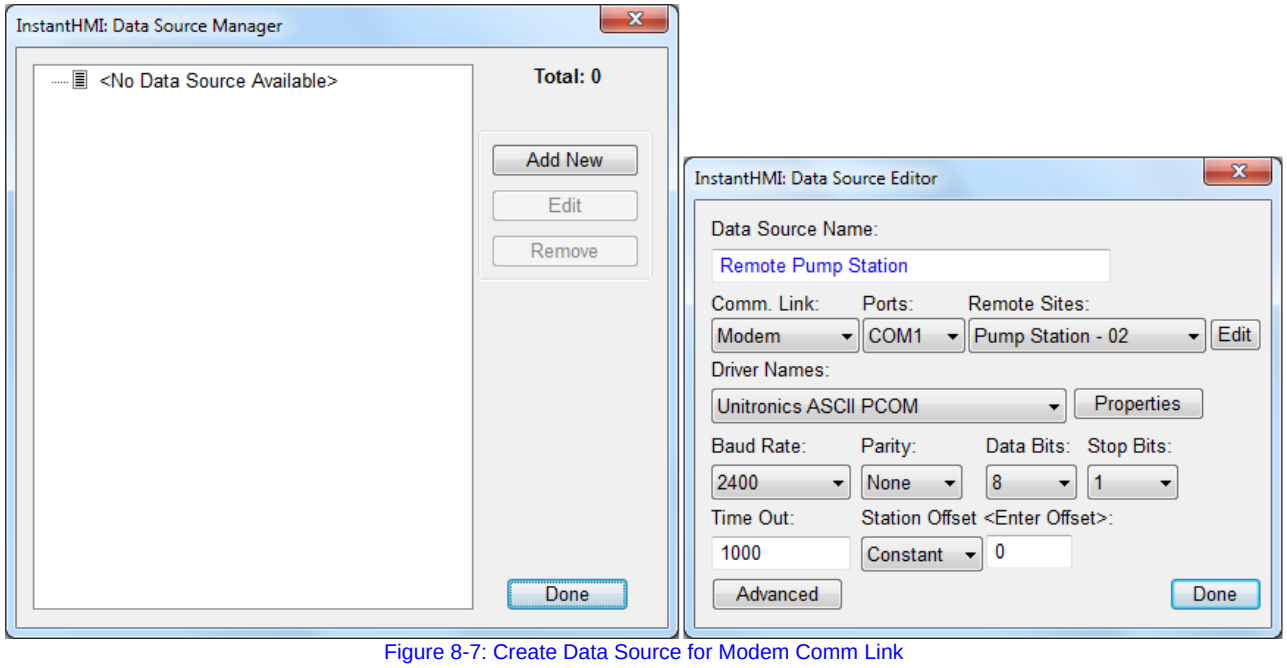


Figure 8-7: Create Data Source for Modem Comm Link

In Data Source Manager dialog, click on 'Add New' button to create a data source with Modem Comm Link with desired parameters (Example: 'Remote Pump Station', Com1, to connect to Remote Site 'Pump Station – 02', using driver Unitronics ASCII PCOM, Baud Rate 2400, etc.). Note: If Remote Site(s) are not setup, click on Edit button to access the Remote Site Manager and setup sites as indicated in Step 3. Otherwise skip to Step 4.

Step 3: Create Remote Sites using Remote Site Manager

The Remote Site Database (IHMI-ModemDB.idb) contains Site Names, Telephone #, and Site Description for all the remote sites you may want to access over the modem link.

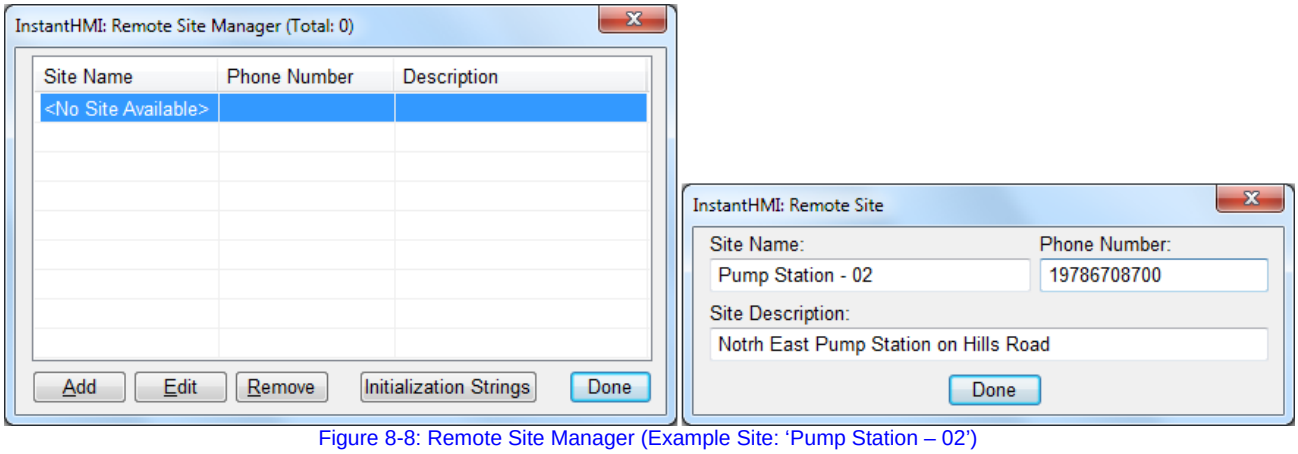


Figure 8-8: Remote Site Manager (Example Site: 'Pump Station – 02')

In Remote Site Manager dialog click on Add button and for each site enter the following parameters: Site Name, Phone Number and Site Description (Example Shown: 'Pump Station – 02'). The Remote Site modem 'Initialization Strings' were already setup in Step 1.

Step 4: Store Initialization String for Local modem in Site Database

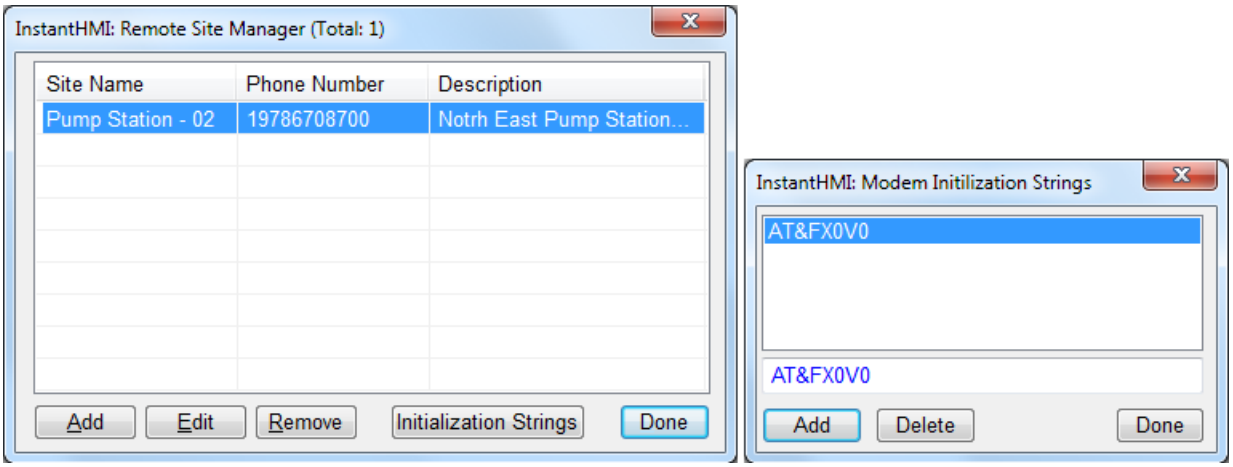


Figure 8-9: Example Initialization String for Local Modem

We will enter and store the Local Modem Initialization String in the database (IHMI-ModemDB.idb) so that it can be used everytime InstantHMI Runtime starts to properly initialize the local modem. In the example shown the Local Modem is set to result code numeric.Your modem may require a different command to accomplish this task.

Step 5: Cabling for Local and Remote Modems

Connect the Local Modem to the InstantHMI Runtime computer serial RS232 port (or USB to Serial adapter) using a straight through cable; you may also use an USB modem. Connect the Remote modem to the PLC using a **Null-modem cable or other appropriate cable**.

Step 6: Test Modem Comm Link Setup in InstantHMI Runtime

At runtime the local modem connected to the computer is setup correctly by InstantHMI using the 'Initialization Strings' for modem setup in Remote Site Database (IHMI-ModemDB.idb) for your Project. During initialization InstantHMI will display a **Modem Interface Dialog Box** listing the Remote Sites (telephone numbers and descriptions you have entered in the database IHMI-ModemDB.idb). The operator can select one of the listed sites and click on 'Call Remote Site'. InstantHMI Runtime will start dialing the remote site. If connection is established, the first screen will appear. If connection fails then InstantHMI Runtime will allow the operator to attempt the connection again. The operator may retry another site or Exit InstantHMI Runtime and seek assistance from the supervisor. From the Modem Interface dialog box the user can also click the 'Listen for Incoming

Call' button to setup InstantHMI to listen for incoming calls. Once a connection is made the Runtime will display the first screen.

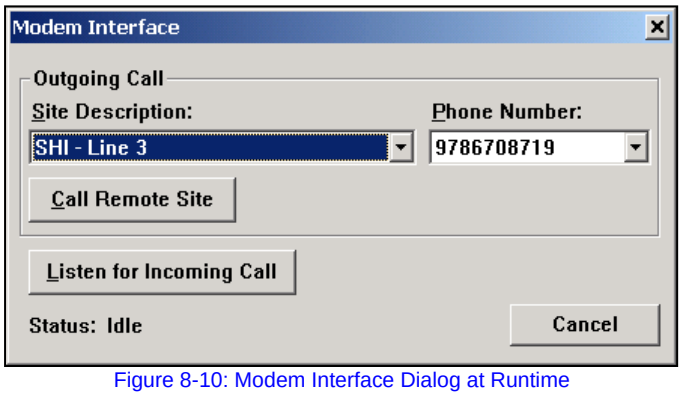


Figure 8-10: Modem Interface Dialog at Runtime

8.7.1 Using Modem with Unitronics PLC

You may have a problem communicating with the IDEC Micro1 PLC, because IDEC Micro1 PLC port setting is set at 9600 baud, 8 data bits, 1 stop bit, even parity and is not changeable. Communication with this port specification requires a 11-bit modem (most modems are 10 bit modems).

Also note that IDEC PLC communications may require the baud rate to be no higher than 2400. If you need to change the baud rate in your IDEC PLC please consult the appropriate IDEC PLC manual.

8.7.2 Trouble Shooting

If you are having difficulty communicating from the PC to the PLC using modems the suggestions in this section may help you.

Step A: Make sure you can communicate from the PC to the PLC directly (eliminating the modems) at the same baud rate you are attempting to communicate over the modems. **Note:** the cable connections for this will not be the same as that involving modems.

Step B: If you are successful in Step A, but are unsuccessful using the modem at the baud rate used in Step A, then try using a lower baud rate. For example, to get your Zoom modem (Zoom/Fax Modem VFXV.32BIS Model 360) communicating at 2400 baud do the following:

1. Configure your HOST modem (the one attached to the InstantHMI Runtime PC) with the following initialization strings:

   AT&F&C0&D0&S0N0S37=6%E0%C0&K0
   AT&R1Q0V0&Y0&W0

2. Configure your REMOTE modem (The REMOTE modem is the modem attached to the PLC) with the following initialization strings:

   AT&F&C0&D0&S0N0S37=6%E0%C0&K0
   AT&R1Q1V0S0=1&Y0&W0

3. Your modems should now be set to run properly at 2400 baud.

4. Now configure Local Modem, in Windows Device Manager, to communicate at 2400 baud as follows:

- In Windows Click on **START → CONTROL PANEL →SYSTEM → Device Manager**.

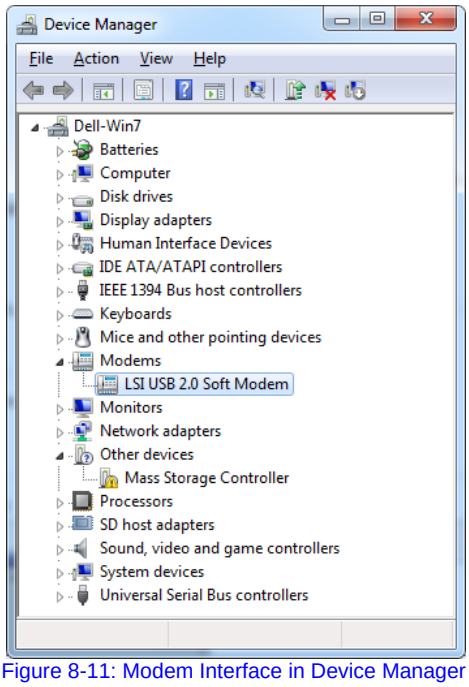


Figure 8-11: Modem Interface in Device Manager

Click on **Modems** and ensure that your modem device is listed.

The modem parameters are already setup in the Data Source definition (Section 8.7.2).

Step C: Once you get your modem working reliably at a lower baud rate you may repeat the above steps to try a higher baud rate. Please note that a higher baud rate does not necessarily mean a higher through put as far as communication between PC and PLC over a modem link is concerned. It is more important to have reliable communication than a nominal higher baud rate setting.

Note: Baud rate is often incorrectly used to mean 'bits per second'. While **Baud rate** refers to the electrical signaling rate of a communication line, **bits per second** is the rate of transfer of information over the communication line. Baud rate and bits per second are equal only when one data bit is encoded in one signaling period. Most modems today operate at 2400 baud while the bits per second may be 14400 bps or much higher. Data compression and encoding schemes are used to accomplish a higher bit transfer rate at a more earthly baud rate (such as 2400 baud).

9 Runtime Engine (PC)

9.1 Introduction

InstantHMI LaunchPad (Section 2) allows you to design your HMI project on a Windows PC platform, and deploy it on any Windows PC, or Windows CE, or PDA (Windows Mobile, Pocket PC, Smart Phone) platform, which has an installed InstantHMI Runtime Engine.

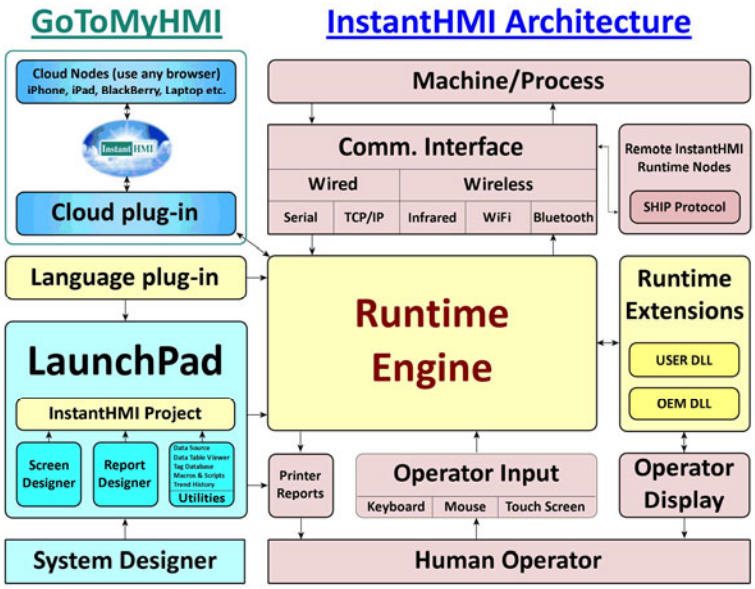


Figure 9-1: InstantHMI Architecture

Using the InstantHMI LaunchPad to design appropriate project elements for one or more runtime engines, you can accomplish your application objectives including the following:

- **Monitoring** useful process variables.
- **Data Entry** for direct setup and control of process by operator.
- **Trending** important variables for ensuring production quality.
- **Alarm monitoring** acknowledgement and response from 'anyplace, anytime'.
- **Data Logging** on selected variables for troubleshooting and productivity enhancement using historic trend analysis.
- **Recipe Control** for repeatable and quick batch process setup.
- **Reporting** as per your template for your production and management personnel.
- **TCP/IP Connectivity** for access to the process or machine control data from other PC's via LAN or over the Internet.

Any additional requirements of your application not readily supported in InstantHMI may be accomplished by extending the functionality via OEM DLL and User DLL, which can be programmed by you and/or us to meet most any requirements.

In order to accomplish the above objectives, the Runtime engine utilizes a communication link (Section 8) and a driver (COMMxx.DLL) to connect the operator and the raw data source (via programmable and other I/O controllers used in the application).
The two-digit number xx in COMMxx identifies the communication driver:

04 for Modicon RTU Comm04.DLL driver,
33 for Allen Bradley DF1 driver Comm33.DLL,
78 for Allen Bradley EtherNet/IP driver Comm78.DLL, etc.

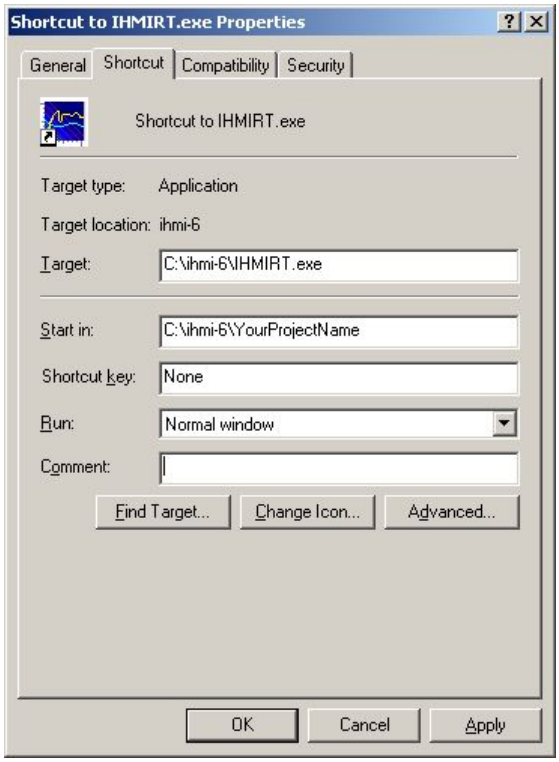
A variety of communication drivers are available. A partial list of drivers is included in Appendix C; please consult Software Horizons for your driver needs. Also, Multiple driver support is available where additional drivers are connected to other communication ports on the computer. These drivers may be for other PLC's or other I/O devices. A driver kit comm00 is available to help you write your own drivers. Software Horizons can

also provide you with a price quote for the services to customize the driver kit or the User DLL to meet any special requirements of your application.

If InstantHMI is not installed on your platform do so now (Appendix A). You can access the runtime engine by clicking on the runtime icon (or the Run Project button on the InstantHMI LaunchPad if the runtime is installed on the same PC). Section 9.2 lists the steps you need to follow to get your application running in InstantHMI.

How To Run InstantHMI Runtime without LaunchPad (using a Shortcut)

You cannot run the Runtime program 'IHMIRt.exe' directly. You'll need to create a shortcut to IHMIRt.exe and then modify it by putting the full path to your Project folder in the "Start In" section of your runtime shortcut. See picture below for an example.



Also, you need to ensure that your project is the currently selected project in the LaunchPad. If you are unable to run the LaunchPad, you can manually edit the text file 'C:\Windows\IHMI-6.ini'. Look for the [PROJECT] section and modify 'CURRENT_PROJECT=' so it points to your project name. For example:
CURRENT_PROJECT=YourProjectName

Without the LaunchPad you also have to modify the following lines:
NUM_PROJECTS=Y (where number Y=X+1, where X is the previous value)
PROJECTY=YourProjectName (Replace Y with the number you entered in NUM_PROJECTS)

Save the IHMI-6.ini file and then your shortcut should work and start the Runtime with your Project.

9.2 Your Application Step By Step

9.2.1 'Hit the Ground Running'

If you wish to add HMI capability to an existing controller, and have a computer with InstantHMI Runtime installed, just use an appropriate communication link to hook up the controller to the Runtime. The New Project Wizard gets you ready to 'hit the ground running'.

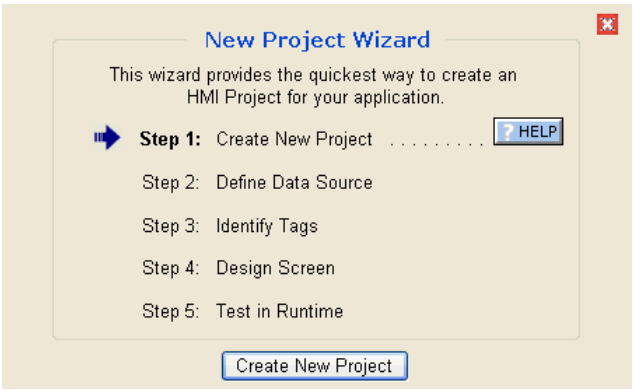

New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Create New Project . . . . . HELP
Step 2: Define Data Source
Step 3: Identify Tags
Step 4: Design Screen
Step 5: Test in Runtime
Create New Project

Figure 9-2: New Project Wizard

First time you are running 'New Project'

Click on LaunchPad → Setup → New Project. This starts the New Project Wizard.
(At any step, click on Help for a quick review, if needed.)

Step 1: Click on 'Create New Project' button.

Step 2: Click on 'Define Data Source' to specify a Data Source to access the controller. The Data Source sets up the communication link with your controller.

Step 3: Click on 'Identify Tags' to specify a Data Block to monitor from the controller. The wizard will display a Data Table Viewer for the controller. Use Data Table Viewer to monitor/modify controller tags and transfer selected pre-tested tags of interest to the Tag database

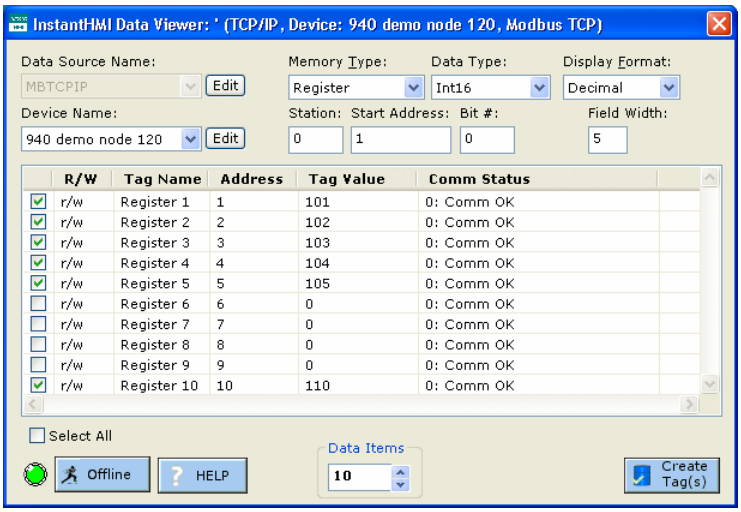


Figure 9-3: DataViewer-Modbus

Step 4: Click on 'Design Screen' to access the Screen Designer and build a screen using widgets etc. You may skip designing a screen since the Runtime generates automatically a WatchList screen. If no screens have been added to the project this WatchList screen will appear as the first screen. Otherwise this screen will be the last screen.

Step 5: Click on 'Test Screen in Runtime' to verify the functionality of the screen you designed. Switch to Watch List or other available 'pre-formatted screens' for monitoring, data entry and supervisory control. Use Watch Lists in Runtime to monitor/modify controller tags from different groups. A single watch list (in an object assembly) can provide a comprehensive, yet simple, interface to let you monitor thousands of tag variables, for dozens of controller stations in a very concise and familiar manner (like browsing through the Controller user manuals).

Subsequent times you are running 'New Project'
Setup the project to run the way you want. Design project elements (Screens, macros, scripts, etc.) as desired. Use dynamic runtime association of Object Assemblies with multiple Tag Groups for streamlined monitoring of similar sub-systems.

9.2.2 Methodically Design Your HMI

Now that you have a functional HMI, proceed to methodically enhance your InstantHMI Project design to suit all your application requirements.

Step 0. Game Plan: An InstantHMI Project implements the 'model of the Process or Machine Control Application' for the benefit of operators, supervisors and management who are responsible for the proper and efficient operation of the machine and the plant. Visualize your application in terms of the data sources available for the raw data to be presented via display data objects on the screens to assist the Operator in his task of monitoring and control of the Machine/Process using the runtime platform chosen by you.

> Note: We recommend that for self-training on screen design, controller interface and project design you refer to the separate document '**Quick Start Guide**'. See Section 1.6 for a brief description of the Water Supply System application used in the Quick Start Guide for illustration.

STEP 1. Screens: Use InstantHMI LaunchPad tools (Tag Manager, Data Source Manager, Data Viewer, Watch List and Screen Designer) to rapidly create and test the Tag Database and preliminary screens for your application (see Sections 2, 4). Refine the screens to enhance the operator comfort and effectiveness (using subsequent iterations as necessary). Save your application screens in the Project directory using names of your choice to suit application functions.

Note: At runtime, the operator may right click on the screen to access a pop-up menu; this menu includes the option of displaying or hiding the Status Bar (bottom of screen), Title Bar (top of screen), Menu Bar (below Title Bar) and Tool Bar (below Menu Bar). While creating your screens you should either not use the space intended for status bar / tool bar for your objects or be prepared for some portion of screen to be hidden when status bar / tool bar appears in the runtime screen view. Use the Runtime Option 'ALLOW_RIGHT_CLICK' to Enable or Disable 'Right-click' menu pop-up functionality for Runtime Engine (Section 9.4).

STEP 2. Setup: Click on the LaunchPad → Setup button and verify that the project setup parameters are as desired (Section 9.3). Be sure the "Driver Name" parameter in data source matches your PLC driver. Create as many data sources as necessary to match the communication links and controller network.

Note: If your installation does not include the options you need, then you will not be able to access some of the InstantHMI functionality. If you only have the demo version of Runtime Engine you do not need a driver.

Use Screen Designer also for Screen Passwords. Exit Screen Designer. (You may skip Steps 3-5 in the early stages). Use the Setup command to setup User password security levels to Administer, Design, and Run your project.

STEP 3. Reports: Use Report Designer (Section 5) to create all the printer report and spool record templates.
STEP 4. Customization: Use the Macro Editor (Section 5), Script Editor (Section 6), and Data Source Manager (Section 2.3.5) to set up macro commands, scripts, and remote data sources to enhance operator convenience.

STEP 5. Special Tags: If your application requirements dictate use of the special tags (setup by you in your PLC ladder logic or in Local memory) define them in your InstantHMI project setup to enable event driven printer reports, spool reports, etc. Simulated PLC functions are available in certain Local memory locations (Section 3.3.3).

STEP 6. Test: Click on the Run button on the LaunchPad or on the Runtime Engine icon. Test your application screens.

Repeat Steps 1-6 for each screen incrementally and test your application and proceed to complete your project. The method you adopt will depend on your convenience. We recommend that at the beginning you skip Steps 3-5, and get a simple screen working, and then include Step 3 and/or Step 4 and / or Step 5 in the next iteration. *It is important that you check out communication with your PLC before investing your time on elaborate screens.*

Note: The number of monitored fields and the sampling time will affect the communication performance of InstantHMI. Smaller number of monitored fields (on the current screen), smaller number of alarm check fields, smaller number of data log fields, and larger sampling times lead to better performance. You should keep this in mind while designing your screen. We suggest you use Date or Time tied to local memory as a monitor field if you have no other monitor fields on screen.

Example application screens are shown in Figure 9-4. We recommend that before setting up your own application you review the '2-minute Free Demo' for ideas in setting up your project elements. We recommend that for self-training on screen design, controller interface and project design you refer to the separate document '**Quick Start Guide**'. See Section 1.6 for a brief description of the Water Supply System application used in the Quick Start Guide for illustration. Additional training (and complete Application setup with screens, reports, messages, alarm logging etc.) is available at a reasonable cost from Software Horizons.

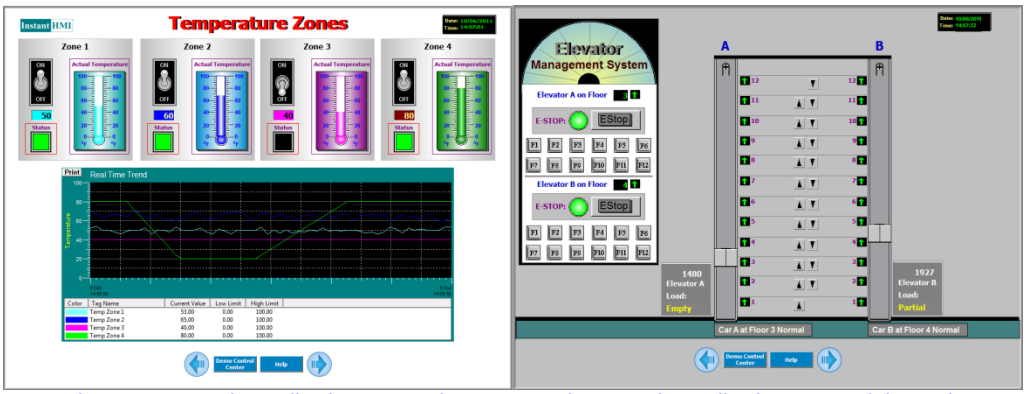


Figure 9-4: Sample Application Screen (Temp. Zones) & Sample Application Screen (Elevator)

Your Project directory should have the tag database, screens, report templates, spool record templates, macro files, script files, etc. you created for the project. Make sure your data source (and communication setup) is the way you want for your application. The standard setup elements are discussed in Section 9.3.

Make sure that the Human Machine Interface hardware (computer, VGA Monitor, and printers, if any) are energized. Your PLC should be powered up as well and wired up properly for communication. Make sure that InstantHMI is properly installed, registered, and activated with activation code provided by Software Horizons.

9.3 Project Setup

Runtime Engine uses the Data Source parameters to configure the communication ports, and other setup parameters to identify special purpose registers in your PLC, etc. To make changes in the setup, use the LaunchPad → Setup button.

9.3.1 Data Sources

InstantHMI supports various communication links (serial, Ethernet, IR, RF, etc. depending on runtime platform - see Section 8) to access the raw data for your application. Use the Data Source Manager and Editor to setup one or more data sources as required for your application. You may define multiple data sources, each associated with a different communication driver in the same application. Carefully select the data source comm link parameters (Baud Rate, Parity, Data Bits and Stop Bits) to match the corresponding communication parameters in your PLC. Make sure the com port name COM1, COM2 etc. matches the com port to which your PLC is connected. Finally, the Driver Name should match the InstantHMI driver name for your PLC.

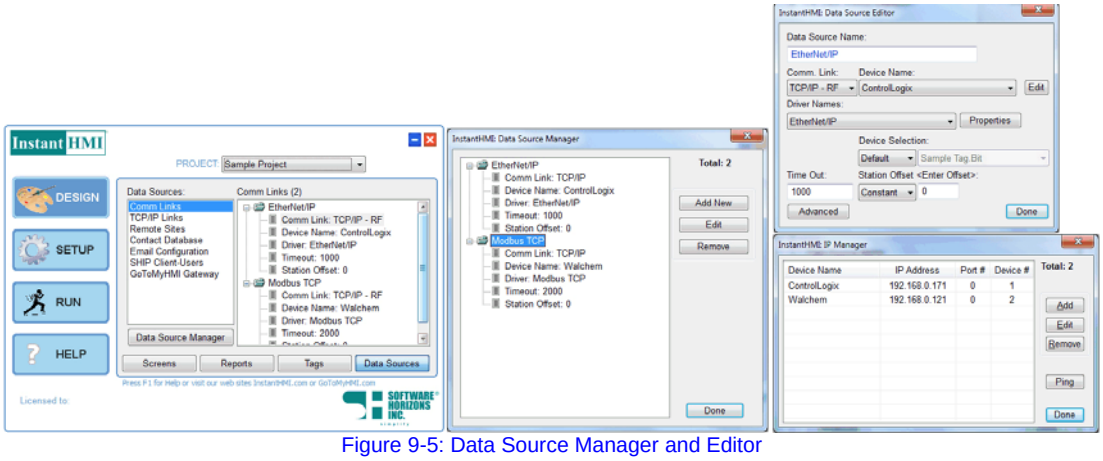


Figure 9-5: Data Source Manager and Editor

If you are using a printer, connect it to the appropriate port on the PC. Printer reports are also saved to disk. We recommend that you refer to the spooling capability (Section 5.3) in InstantHMI for greater control of your saved reports. Any printing will be done on the printer configured for printing under Windows.

9.3.2 Screens

You may use the LaunchPad → Setup → Screens command to decide what screens are included in your project. The first screen is the one Runtime Engine will display after the Logo screen.

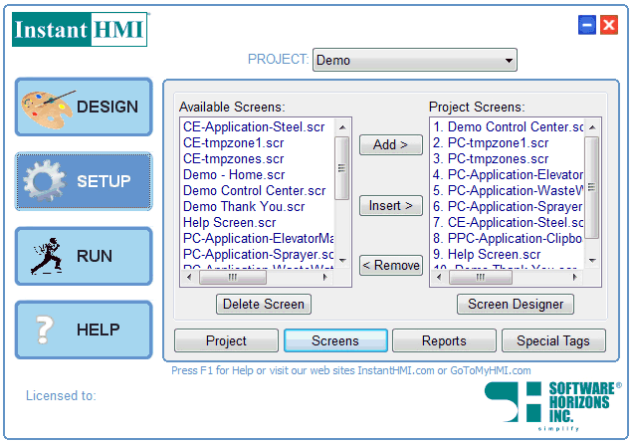


Figure 9-6: Project Screens

The order of the screens is controlled by you and serves merely as an added convenience for the operator when he uses the runtime Screens → Select menu. The screens at runtime may also be accessed by the operator using the corresponding Function keys <F1>, <F2>, etc. (defined in the global Project Macros file Macros.IDB) (see Section 9.4.10).

9.3.3 Special Tags

Command	Functions	Project Elements	Tool or Utility	Section
Setup	Special Tags	Print Control Tags	Tag Manager Add, Remove Dialog	2.4.7
		Spool Control Tags		
		Switch Screen Tags		
		Update Enable Tags		
		Recipe Enable Tags		

Figure 9-7: Setup Special Tags

InstantHMI allows you to define several Special Tags for performing special functions: Print Control, Spool Control, etc. The tags in this group may be setup so that you may control printing, spooling, etc. (without operator intervention) from your PLC, based on events detected in your PLC. To use any of the special tags assign one or more tags from your tag database to each of the Special Tags Group, with the tag parameters Memory Type, Address, Bit Number, Data Source, etc. to suit the special register you have defined and setup in your controller. Since you may assign multiple tags for each of the Special Tags, when you have multiple PLC stations the same 'special register' from each of the stations can then perform the specified special function.

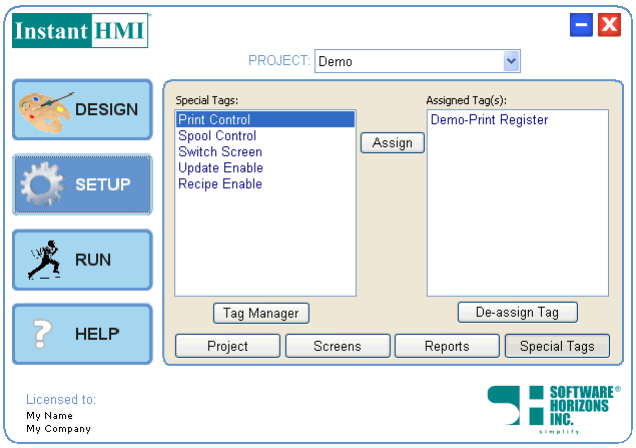


Figure 9-8: Special Registers' for Project Setup

Print Control Tag

The Print Control Tag is used for causing a printout of reports based on some "events" detected in your PLC. A value of 1 in this register will cause report 1.PRT to be printed; if value is 2 then report 2.PRT will be printed etc. The register value will be changed back to 0 automatically by Runtime Engine once your request for printing is processed. You should control the value in the Print register to produce event driven reports as often as you want. Note that the Operator can use the Print system key (Section 9.4.10) to produce reports on demand.

Spool Control Tag

The Spool Control Tag is analogous to the Print Control Tag and is used for spooling reports to disk based on some events detected in your PLC. See Section 5.3 for a detailed discussion of Spooling. You may equate the process of spooling to printing on virtual printers (i.e., print spools created for you inside your computer). A value of 1 in this register will cause spool report corresponding to the spool record format file 1. SPL to be spooled to disk; a value of 2 will cause spooling of 2.SPL etc. The register value will be changed back to 0 automatically by Runtime Engine once your request for spooling is processed. You should control the value in the spool register to produce event driven spooling. Note that the operator may use the Spool Menu or a suitably defined Macro button to produce spooling on demand. Of course, any of the spooled reports can be included as part of a regular printed report (See Section 5.2.4 and also Section 5.3).

Switch Screen Tag

Use Switch Screen Tag if you wish to switch screens dynamically from your PLC without Operator intervention. The value in this register will determine which screen will be displayed on the monitor. This register may be used, for example, to display an Alarm Screen when an alarm condition is

detected. Appropriate alarm messages can be displayed on a designated alarm screen using the Message format for display data object (see Section 4.11.2).

Update Enable Tag

The Update Enable Tag may be used as a **super password** for enabling or disabling Operator access for updating the screen input parameters as it provides a means for the PLC ladder logic to control change of input parameters through the InstantHMI interface. A value of 2 in this register will signal InstantHMI that the Operator is allowed (read/write access depending on his password) to observe and to change input field data values on any screen. A value of 1 in this register will signal InstantHMI the Operator is not allowed to change input field data values, as he is allowed only a Read access to monitor the field. A value of 0 in this register disables both Read access to monitor and write access to modify any fields; that is no access to any screen with input fields will be provided. Of course, there is also a separate Password protection for each screen that you could also use (see Section 4.9.3). You may eliminate use of this parameter completely; in this case it will be assumed that update enable register value is always 2. Note that to use this super password feature effectively, the authorized operator (supervisor?) should have a way of modifying the register value. (A hardware key could be wired as a direct input to the PLC Update Enable Register for this purpose.)

Recipe Enable Tag

The Recipe Enable Tag may be used as a **super password** for enabling or disabling Operator access for uploading/downloading the recipe parameters as it provides a means for the PLC ladder logic to control change of recipe parameters through the InstantHMI interface. A value of 2 in this register will signal InstantHMI that the Operator is allowed (upload/download access depending on his password) to observe and to change recipe tag values through the Recipe Manager. A value of 1 in this register will signal InstantHMI that the Operator is not allowed to upload/write recipe tag values, as he is allowed only a download/read access to monitor these tags. A value of 0 in this register disables both download/read access to monitor and upload/write access to modify recipe tags; that is no access to Recipe Manager will be provided. Of course, there is also a separate Password protection for each screen that you could also use (see Section 4.9.3). You may eliminate use of this Recipe Enable Tag completely; in this case it will be assumed that recipe enable tag value is always 2. Note that to use this super password feature effectively, the authorized operator (supervisor?) should have a way of modifying the register value. (A hardware key could be wired as a direct input to the PLC Recipe Enable Register for this purpose.)

9.3.4 File Locations

Drive and Directory for Data Logging

This is the drive that will be used for saving or retrieving any data while InstantHMI is running. If this is a floppy drive make sure you have a formatted disk available in this drive when InstantHMI is running. You may also specify a directory for data logging. The files saved in this directory include Alarm Logs, spooled report files and printer reports. See Section 5.3 for a discussion of data logging.

Drive and Directory for Recipes

This specification, similar to data logging, allows you to keep the recipe files separate from other files. You specify the name of the recipe group. The tags in the group define the data fields to be included in the recipe (see Section 3.6 for details).

Database Source Name

InstantHMI allows you to collect data from any of the monitored data fields on any of the screens at specified data logging rates for the fields. You can specify the database source name for the data collection (see Section 13).

9.3.5 Data Logging

Data Logging is an available optional feature in InstantHMI. As discussed in Section 3.7, two types of data logging may be supported on your platform:

- Time based data logging and
- Event triggered data logging.

For Time Based Data Logging, any tags from the tag database may be assigned a Datalog Sample Time (Section 3.3.7). At runtime access the Data Log Manager (use the **Data Log** button/menu from the Main Menu) to add/remove tags from the list of tags to be logged, Start/Stop logging data for a selected tag, view logged data etc.

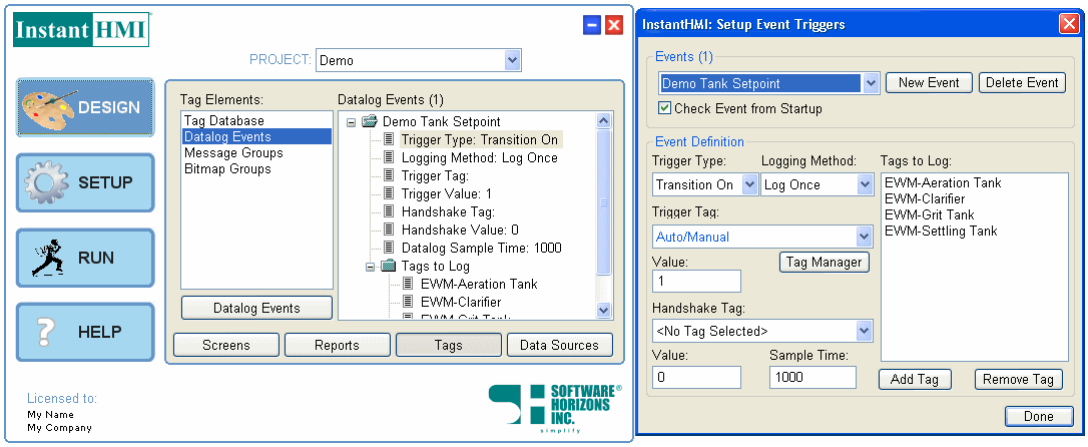


Figure 9-9: Design →Tags → Datalog Events- Setup Event Triggers

Use the LaunchPad → Design → Tags and select Datalog Events to access the Datalog Event Manager. You may think of event triggered Data Logging as the response to the following conditional statements:

If (Event1) then datalog (Tag List1),
If (Event2) then datalog (Tag List2), etc.

For example, suppose you have a tag called Temperature with a high value THigh and a low value TLow and you wish to log Temperature values if it is in high alarm condition (Temperature > THigh) or in low alarm condition (Temperature < TLow). You define Event1 with Trigger Tag as Temperature and Trigger value = Thigh, Trigger Type = Transition On, Datalog Type = Log Continuous, and include Temperature tag in the datalog tag list. You also define Event2 with Trigger Tag as Temperature and Trigger value = TLow, Trigger Type = Transition Off, Datalog Type = Log Continuous, and include Temperature tag in the datalog tag list. Finally, you choose both Event1 and Event2 as Datalog Trigger Events. This will ensure that the tag Temperature will be logged whenever it is in alarm condition.

9.4 Runtime Menu

When you click on the **Run** button, the LaunchPad gets ready to run your project and displays the following dialog.

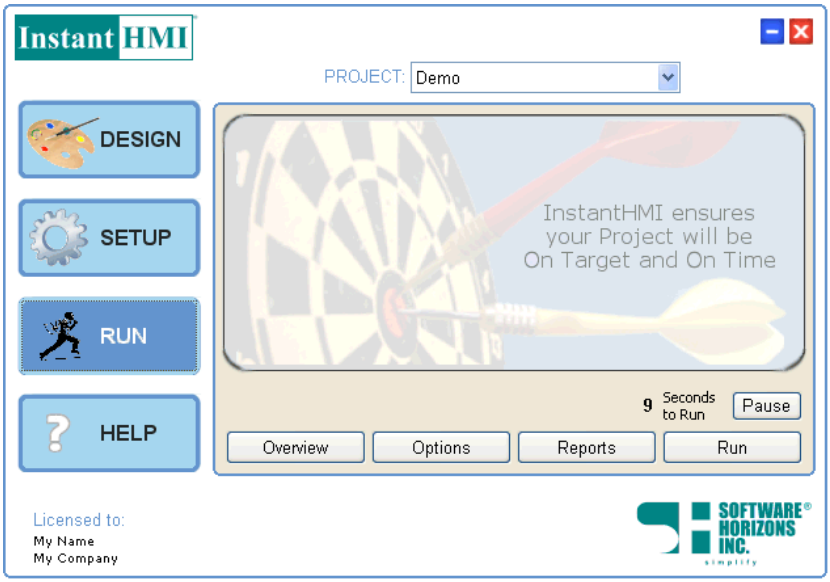


Figure 9-10: Project Runtime - Paused for Review

LaunchPad will start the runtime after specified 'Run Delay Time' seconds if the parameter 'Enable Run Delay' is enabled and 'Auto Start Runtime' is disabled. For convenience, this dialog has a Pause button, which can be activated when there is time left to go ahead with the Runtime Execution. You may click on RUN to proceed immediately. (The Run button is enabled if the Target Platform for the current project is the Windows PC platform, on which the LaunchPad is installed. Otherwise, the RUN button will be relabeled 'Emulate Target'.) The Runtime may also be setup to be run in the future on its own (without LaunchPad involvement). Click on Overview button for a Project Overview; click on Options button to review the Runtime Options. Click on RUN button to let the Runtime Engine run your project. Note: You may right click on the LaunchPad border and select 'Project Overview' or 'Runtime Options' from the pop-up menu, to display the corresponding dialog.

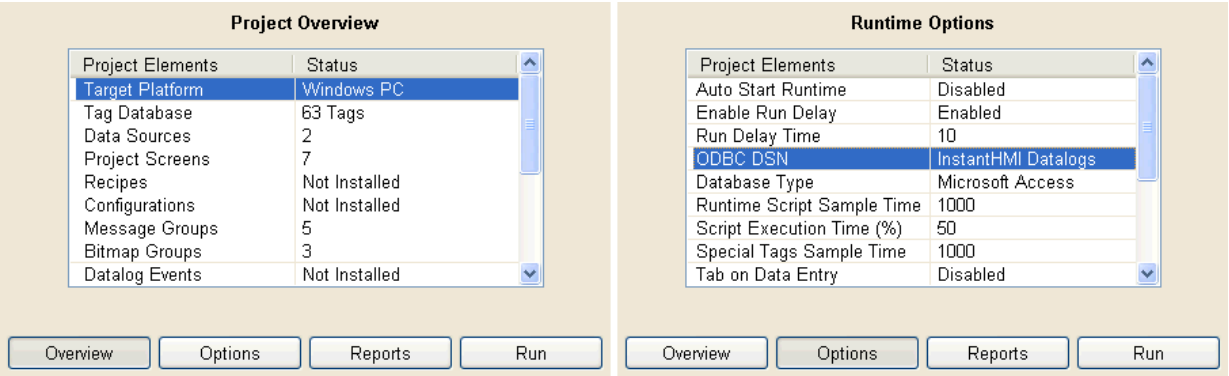


Figure 9-11: Project Overview and Runtime Options

The **Project Overview** dialog shows which project elements are included in your project: the number of screens in your project, the platform on which the project will be deployed, etc. For a detailed review of your project setup click on LaunchPad → Setup and modify setup parameters if desired (Section 9.3).

The **Runtime Options** dialog shows status of parameters such as Auto Start Runtime, Datalog Database Type (Access or SQL), etc. You may double click on any of these to edit these parameter settings. You may also review your project runtime options by clicking on LaunchPad → Setup and modify setup parameters if desired (Section 9.3). The Runtime Options are listed in the Table below. These are saved in the 'Project.ini' file; however, we strongly recommend that you do not change setup parameters directly in the 'Project.ini' file to avoid unpredictable or inconsistent runtime behavior. Most Parameters and settings are self explanatory. Runtime SHIP-Server parameters (Server Status, Server Registration, etc.) are documented in Section 11.

InstantHMI allows multiple core processing. This feature is enabled by setting 'ENABLE_MULTICORE' = 1 in the Runtime Options.

Parameter Name	Parameter Key (in Project.ini)	Parameter Values	Project.ini Section
Auto Start Runtime	AUTO_START_RUNTIME	0 (Disable), 1 (Enable)	[SETUP]
Enable Run Delay	RUN_DELAY_ENABLED	0 (Disable), 1 (Enable)	[SETUP]
Run Delay Time	RUN_DELAY_TIME	10 (Sec)	[SETUP]
Enable Multicore Processing	ENABLE_MULTICORE	0 (Disable), 1 (Enable)	[SETUP]
Project Initialization	RUNTIME_READ_ALL_SCREEN	0 (First Screen Only) 1 (All Screens)	[IHMIRT]
ODBC DSN	ODBC_DSN	InstantHMI Datalogs	[SETUP]
Database Type	DATABASE_TYPE	Microsoft Access, MySQL	[SETUP]
Database Size (MB)	DATABASE_SIZE	2000 (Microsoft Access only)	[SETUP]
Spool Report Folder Name	OutputFolderName	Folder Name	[SPOOL]
Print Report Folder Name	OutputFolderName	Folder Name	[PRINT]
Runtime Script Sample Time	RUNTIME_SCRIPT_SAMPLE_TIME	1000 (msec)	[IHMIRT]
Script Execution Time (%)	SCRIPT_EXEC_DURATION_PERCENT	50 (%)	[IHMIRT]
Special Tag Sample Time	SPECIAL_REG_SAMPLE_TIME	1000 (msec)	[IHMIRT]
Tab on Data Entry	AUTO_TAB	NO, YES	[IHMIRT]
Data Entry on Tab	DATA_ENTRY_ON_TAB	NO, YES	[IHMIRT]
Data Entry using QuickPad	DATAENTRY_USING_QUICKPAD	NO, YES	[IHMIRT]
Report Tab Width	TABWIDTH	8	[IHMIRT]
Title Bar	TITLEBAR_VISIBLE	0 (Disable), 1 (Enable)	[IHMIRT]
Menu Bar	MENUBAR_VISIBLE	0 (Disable), 1 (Enable)	[IHMIRT]
Allow Right-Click	ALLOW_RIGHT_CLICK	0 (Disable), 1 (Enable)	[IHMIRT]
Status Bar	STATUSBAR_VISIBLE	0 (Disable), 1 (Enable)	[IHMIRT]
Watchlist Screen	WATCHLIST_SCREEN_ENABLE	0 (Disable), 1 (Enable)	[IHMIRT]
Watchlist Update Time	WATCHLIST_SCREEN_UPDATE_TIME	1000 (msec)	[IHMIRT]
Screen Resolution	RUNTIME_RESOLUTION	0 (As Designed), 1 (Fit to Monitor)	[IHMIRT]
Log Comm Errors?	RUNTIME_LOGCOMMERRORS	YES, NO	[IHMIRT]
Server Status	SHIP_SERVER_ENABLE	0 (Disable), 1 (Enable)	[IHMIRT]
Server Port #	SHIP_SERVER_PORT	2364 (Default)	[IHMIRT]
Server Registration	SHIP_SERVER_REGISTRATION	0 (Don' Register) 1 (Register)	[IHMIRT]
Server Company	SHIP_SERVER_COMPANY	Company Name	[IHMIRT]
Server Name	SHIP_SERVER_NODE	Server Name	[IHMIRT]
Date Format	Date Format	MM/dd/yy (etc.)	[IHMIRT]
Time Format	Time Format	HH:mm:ss (etc.)	[IHMIRT]

Click on the **Run** button or click on the Runtime Engine icon to run Runtime Engine. You should see the InstantHMI splash screen (Figure 9-12) on the Monitor. You may replace this splash screen with your own. The file 0.BMR contains a list of bitmap files *.BMP which represent the splash screen. Create your own bitmap files and include their names in 0.BMR. Note that animation effects can be achieved by a clever sequence of bitmaps.

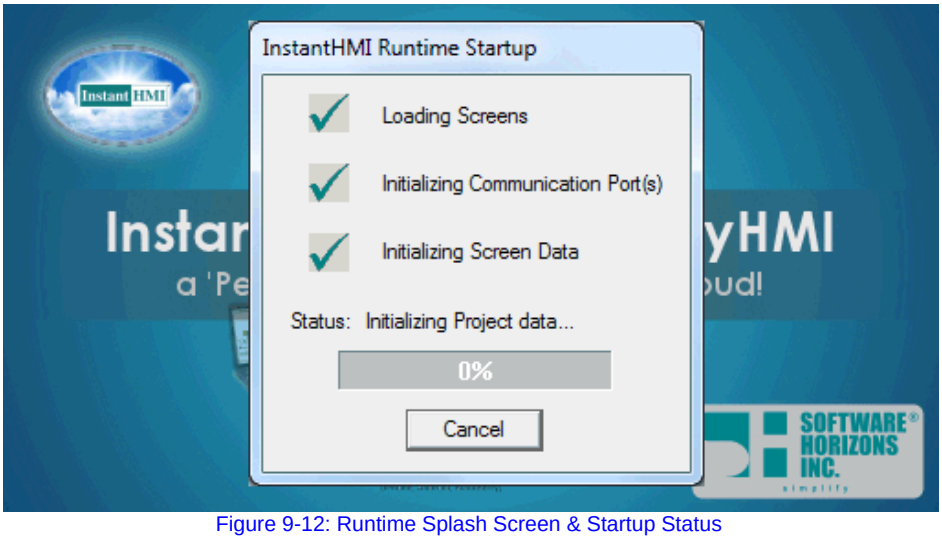


Figure 9-12: Runtime Splash Screen & Startup Status

Once the splash screen appears Runtime Engine initializes its internal data structure for each of the tags associated with your screen data fields. You will see a Runtime Engine Startup Status message box informing you of progress. (You may choose 'Read 1 or All Screens' at runtime startup to reduce startup time of runtime when there are many screens in the project. This is more useful for CE/PPC Runtime Engine.) Finally, the first screen for your application will be displayed on the monitor. If this does not happen, you should check to make sure that all the communication cables are properly connected and then run InstantHMI again. You may copy the Runtime icon to the Start Up Program Group so that InstantHMI will run automatically when the PC boots up.

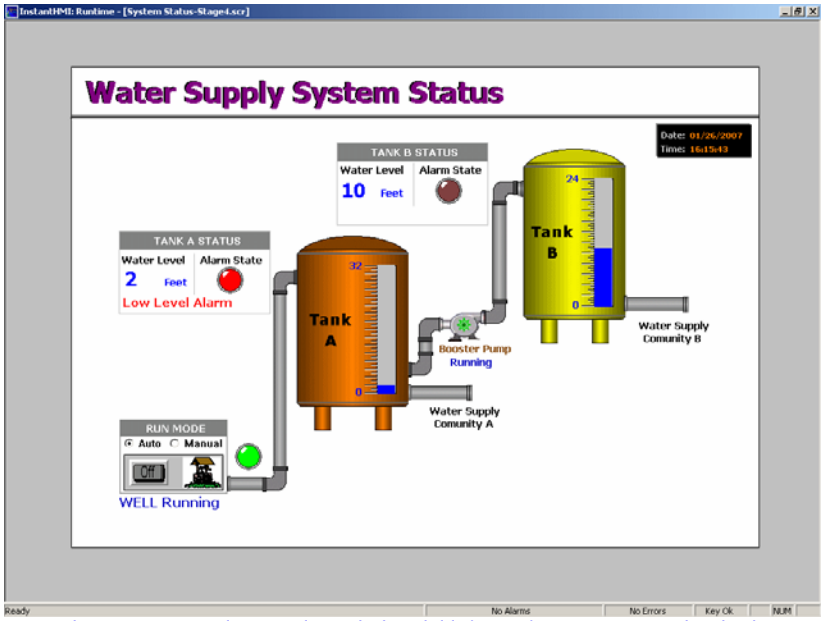


Figure 9-13: Runtime Engine Window (Title/Menu/Status Bars not in View)

The Runtime Engine window (Figure 9-12) has a Title Bar at the top and a Status Bar at the bottom, which may appear based on the operator preference. The project designer may setup the project so that a Menu Bar appears (or not depending on the operator preference). The **Menu Bar** (which may or may not be in view) includes the following commands.

Note: The Title Bar, Menu Bar, and Status Bar may be hidden at Runtime. You may right click on any runtime screen to pop-up a menu that essentially replicates the Menu Bar commands. This menu may be used to Hide/Show the Menu Bar (View command), or Hide/Show the Status Bar or Exit the runtime. You may also use the macro command 'Execute Command (Menu Option)' along with Macro Buttons on the runtime screen to avoid the need for operator use of the runtime menu options (Section 6.3).

Login	Section 9.4.1
View	Section 9.4.2
Screens	Section 0
Recipe	Section 9.4.4
Configuration	Section 9.4.5
Comm Links	Section 9.4.6
Alarms	Section 9.4.7
Reports	Section 9.4.8
Help	Section 9.4.9
Print/Save Screen	Section 9.4.10
Exit	Section 9.4.11

9.4.1 Login

The System Administrator may require a Login Username and Password for authorization to access various runtime functions including exit from Runtime Engine. (Login/Logout capbility is available in both LaunchPad and Runtime on the PC platform.)

9.4.2 View

The View menu offers the following commands to customize the view of the Runtime Engine windows to suit your preferences:

Title	Hide or show Menu Bar
Menu	Hide or show Menu Bar
Status	Hide or show Status Bar

9.4.3 Screens

Click on **Screens → Select** to select a screen; click on OK and Runtime Engine will switch to the screen you selected. You may need Password authorization for this function. For convenience, you may click on the **Screens → Next** or **Screens → Back** command to switch to next project screen or switch back to the previous project screen. Your screen designer can also setup touch zone buttons (Section 4.6.5) on your screen to switch to different screens.

9.4.4 Recipe

See Section 3.6.1 for a discussion of how recipe templates with associated tags are designed and how representative recipes (with nominal tag values) are created for use in runtime recipe manager. When you click on Recipe (on the menu bar) or invoke the 'Execute Command (Recipe Manager)' macro, the Recipe Manager dialog pops-up.

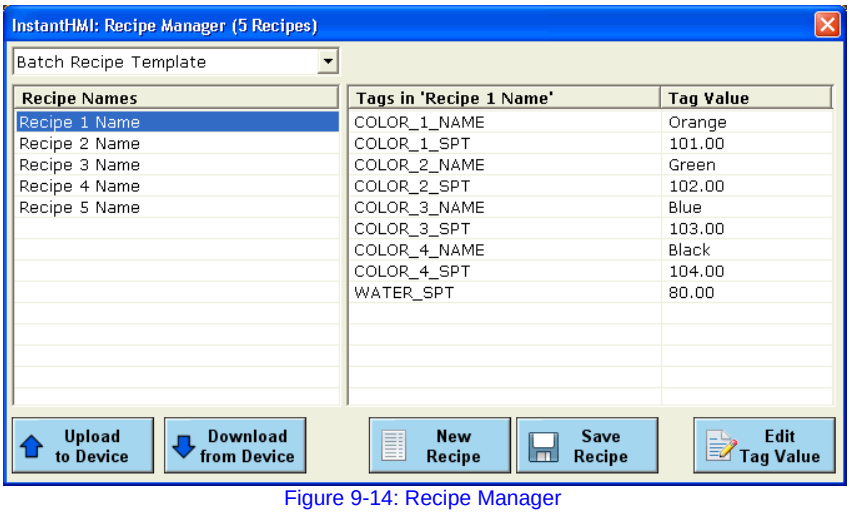


Figure 9-14: Recipe Manager

This dialog includes a pull-down list of recipe templates and a list of available Recipe Names (displayed as a list in the left panel) from which you select the desired recipe. The tags (from the recipe template 'Batch Recipe Template') included in the recipe definition together with the data values for the selected recipe ('Recipe 1 Name') are displayed as a list in the right panel. The recipe manager buttons allow access to the following functions:

- Upload (recipe) to Device
- Download (recipe) from Device
- New Recipe creation
- Save Recipes (to recipe database)
- Edit Tag Values (to modify a recipe)

Click the **Upload to Device** button to transfer the recipe to the device (controller). Click the **Download from Device** button to read the recipe tag values from the device (controller).To edit the recipe tag value, click on the tag to select it in the table of recipe tags, click on the **Edit Tag Value** button and then enter the tag value for the recipe. (You may also double click on the tag to edit it.) To save an edited recipe click on the **Save Recipe** button. You may need Password authorization for this function. The recipe will be saved to the storage medium on the runtime platform.

To make it easier for the operator you may set up macros and buttons as discussed in Section 3.6.5.

9.4.5 Configuration

(Note: Some features in this Section may not be available in the current implementation) See Section 3.6.3 for a discussion of configurations. When you click on Configuration you will see the Configuration Manager dialog box which includes a pull-down list of configurations from which you select the desired configuration. The tags (from the tag database) included in the configuration, together with the associated data values for the selected configuration are displayed in a table in the Configuration Manager dialog.

To edit the configuration tag value, click on the tag to select it in the table of configuration tags, click on the **Edit Value** button and then enter the tag value for the configuration. (You may also double click on the tag to edit it.) To save an edited configuration click on the **Save** button. You may need Password authorization for this function. The configuration will be saved to the storage medium on the runtime platform. Click the **Write to Controller** button to transfer the configuration to the controller. Click the **Read from Controller** button to read the configuration parameters from the controller.

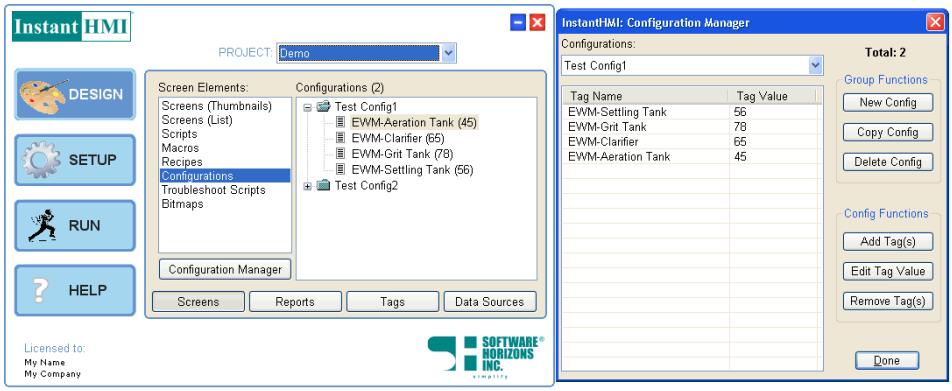


Figure 9-15: Configuration Manager

To make it easier for the operator you may set up macros and buttons as discussed in Section 3.6.5.

9.4.6 Comm Links

(Note: Some features in this Section may not be available in the current implementation) This menu includes two commands: Comm Status and Chat Utility. See Section 11.5.6 for a discussion of Chat Utility.

9.4.7 Alarms

If you observe any alarm conditions displayed on the Status line, or hear any alarm beeping sounds, you may click on the Alarms menu. You will be shown a list of tags which are in alarm condition (High or Low), the alarm limits set for each tag, and the current data value for that tag. You may select any field in alarm condition and click on the Acknowledge button to acknowledge the alarm. Note that under any alarm condition InstantHMI can cause a Beep sound from the computer speaker depending on how the screen tag is setup. (See also Section 9.5).

9.4.8 Reports

Print Report
Use the Reports → Print command to print a report on the printer. You may need Password authorization for this function. This command works exactly like System Key 6: Print (Section 9.4.10). The report printed will correspond to the screen displayed on the monitor. That is, if you are looking at screen 2 and use the Print command then report 2.PRT will be printed. Of course, the format and content of the report is totally flexible and determined by you and may contain any information from any other screen, or any PLC registers not on the screen, if you so desire.

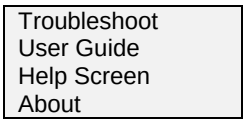
Spool Report
Use the Reports → Spool command to spool reports to disk. You may need Password authorization for this function. This command works exactly like System Key 10: Spool (Section 9.5). The spooled data is controlled by the spool record format for your screen (1.SPL for screen 1.SCR, 2.SPL for screen 2.SCR etc). The saved spool report will be named SPOOL.S1 for screen 1, SPOOL.S2 for screen 2 etc. See Section 5.3 for a detailed discussion on Spooling.

Note that using the SPOOL command in conjunction with the PRINT command the operator can produce totally different reports to suit diagnostic or other special needs.

Log Reports
You may access Alarm Logs, Event Logs, Comm Logs and data logs. The logged data can be transferred to the LaunchPad platform (InstantHMI.MDB or .csv file) and then be subjected to analysis using Microsoft Excel, companion tools (such as Historic Trending, Section 13) or other tools available to you.

9.4.9 Help

The Help menu includes following:



Troubleshoot
When implemented, this will display a Troubleshoot script for the operator.

User Guide
When implemented, this will display a User Guide for the operator.

Help Screen
This will display the Application Help screen if setup by the project designer.

About
This will display the following dialog box:

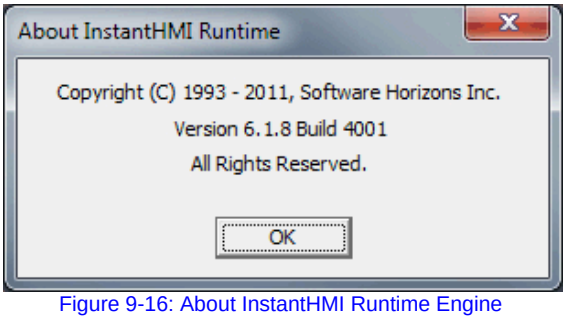


Figure 9-16: About InstantHMI Runtime Engine

9.4.10 Print/Save Screen

Print/Save Screen feature helps operator to create an 'Instant Runtime Status Dump'.

9.4.11 Exit

This command allows you to exit runtime. You may setup a Macro Button with the macro command 'Exit Runtime Engine'; when this macro is executed at runtime it will let the operator exit with or without 'Prompt' (for operator confirmation) as chosen by you (Section 6.3).

You can setup your Project to allow Right-click to Enable or Disable Exit from Runtime Engine (PC and CE). This prevents unwanted exit from Runtime without requiring User Accounts to be enabled. Note: The Function 'Compactify MS Access database' may take a few seconds to reduce database size when user exits the PC Runtime.

Caution: When this feature is enabled and you have User Accounts Disabled, there is NO WAY to exit the runtime! A separate (password protected if needed) screen should be setup with a Button attached to an 'Exit Runtime Macro'. This will allow (authorized) users to exit the runtime and perform project updates, maintenance, etc.

You can also turn on User Accounts and enable a user to have Exit Runtime access.

9.5 System Commands

To access any screens on the monitor when Runtime Engine is running use the Macro buttons setup for this purpose. If no such macro buttons are setup, use the menu command 'Screen'.
Note: The Menu Bar may be hidden at Runtime. You may right click on any runtime screen to pop-up a menu that essentially replicates the Menu Bar commands. This menu may be used to Hide/Show the Menu Bar (View command).

	Key	Function Label	Default Key
*	System Key 0	SCREEN	<Alt S>
	System Key 1	INPUT/FIELD SELECT	<TAB>
	System Key 2	WRITE	<ENTER>
	System Key 3	CANCEL	<ESC>
	System Key 4	YES	<Shift F4>
	System Key 5	NO	<Shift F5>
*	System Key 6	PRINT	<ALT P>P
*	System Key 7	ALARMS	<ALT A>
*	System Key 8	SPOOL	<ALT P>O
	System Key 9	TOGGLE BIT OFF/ON	<Ctrl F5>
*		Runtime Menu must be turned on	

Figure 9-17: Function Key Labels

The Function Keys are listed in Figure 9-17. The InstantHMI System Keys SCREEN, INPUT/FIELD SELECT, WRITE, CANCEL, YES, NO, PRINT, ALARMS, SPOOL, HELP, and TOGGLE BIT

OFF/ON may be used with any screen if the situation permits. These System Keys are described below. As noted, some of these System Keys require the Runtime Menu to be turned on first. You may need Password authorization to access these System Key functions.

Note that the Macro Editor (Section 5) may reassign some keys. For this reason we shall refer here to **System Keys** in terms of their functionality. The specific keys that perform these functions may be the Default keys in Figure 9-17 or any other keys as set up by your System Integrator or Administrator.

System Key 0: Screen
Use this key to access the Screens menu and then select any screen. You may also access a screen by an associated macro button, if provided on the screen.

System Key 1: Input/Field Select
You may use this key to enter data input mode. The Tabbing Order of the user input data fields can be set in Screen Designer (Section 4.9.1). If there are no user input data fields on a screen then this key is inoperative on that screen. (See password protection in Section 4.9.3). Press this key repeatedly to select the user input data field you wish to update or click the mouse on the field to be updated. You may now enter new data for the field using the numeric keys 0,1,2,...,9 or the alpha keys A,B,...,Z or the boolean System Key 4 or System Key 5. **Note:** The Tab key may perform the Write function if Data Entry on TAB is set to YES in InstantHMI.INI file (Section 9.6).

System Key 2: Write
This key is operative only in the data input mode. Once you have entered the new data for a field, press the Write key to make the change in the memory address for this field. Note that the Write function may be incorporated in the Tab key (Section 9.6).

System Key 3: Cancel
This key is operational only in the data update mode. Use this key to cancel the data changes made in the screen field (but not yet written to the memory address for this field), restore data value on screen field and leave the update mode.

System Key 4: YES/ON
Use this key to enter the boolean value YES/ON in a data field. The YES/ON value in Boolean field will turn on the corresponding bit and assign it the value 1.
Recall the discussion on Boolean format in Section 4.11.2.

System Key 5: NO/OFF
Use this key to enter the boolean value NO/OFF in a data field. The NO/OFF value in a Boolean field will turn off the corresponding bit and assign it the value 0.

Recall the discussion on Boolean format in Section 4.11.2.

System Key 6: Print
Use this key to print a report on demand on the printer. The report printed will correspond to the screen displayed on the monitor (as prescribed in your project Setup). Of course, the format and content of the report is totally flexible and determined by you and may contain any information from any other screen, or any PLC registers not on the screen, if you so desire.

System Key 7: Alarms
When you use this key the first time an Alarm Screen will be displayed showing all the Monitor fields from all the screens that have been tagged for checking high and low alarm conditions. The fields that are in an alarm state (High or Low) will be indicated (see also Section 9.4.7).

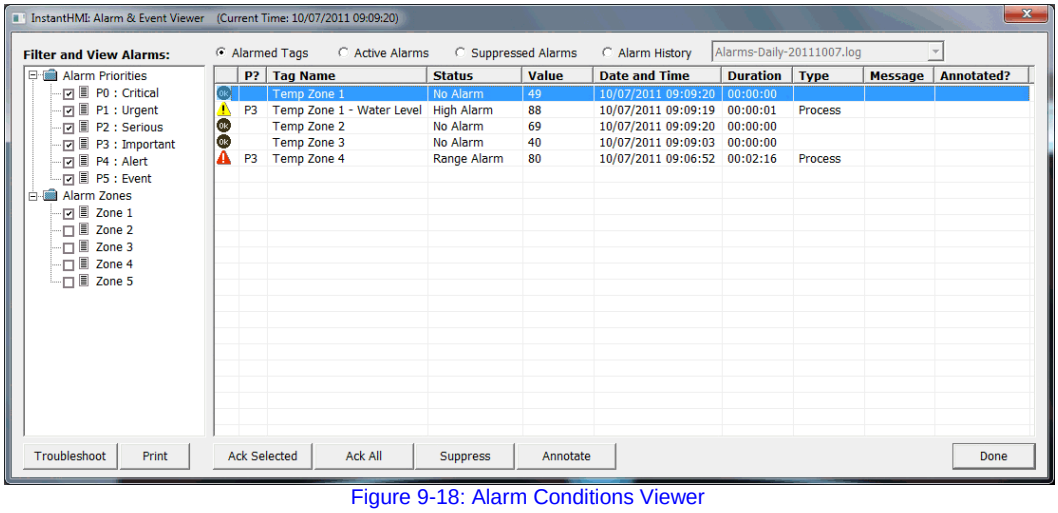


Figure 9-18: Alarm Conditions Viewer

InstantHMI will continue to log the alarms on any Monitor fields whose tag is enabled for alarm checking at tag/screen creation time. Whenever the field data value exceeds the High Limit a High Alarm will be logged. A log file will be created using the file name Alarms-Daily-YYMMDD.log where YY denotes the year, MM the month, and DD the date. The logged message will have the following Ascii format : Ack?, Tagname, Alarm State, Value, Time. If the field data value falls below the Low Limit a Low Alarm will be logged. When the data value in a Monitor field under Alarm state returns to normal range then an Alarm Cleared state will be logged. When you see the Alarm Conditions window select the alarm and click the Acknowledge button. Acknowledged alarms will be marked (with a * or an ACK icon) and logged in the Log file. Select View 'Active Alarms' to see only the active alarms listed. This may be useful to select and acknowledge alarms. Click DONE button to return to your screen.

System Key 8: Spool

This key works similar to System Key 6, Print Key, to spool files to disk on demand. The spooled data is controlled by the spool record format (say, SpoolName.spl) for your screen (assigned in project Setup). The saved spool report will be named SpoolName.S1 for screen 1, SpoolName.S2 for screen 2 etc. See Section 5.3 for a detailed discussion on Spooling.

Note that using the SPOOL Key in conjunction with the PRINT Key the operator can produce totally different reports to suit diagnostic or other special needs.

System Key 9: Toggle Bit ON/OFF

Use this key similar to System Key 4 and System Key 5 to toggle the values in boolean input fields from ON to OFF or from OFF to ON.

9.6 Data Entry in Runtime

9.6.1 Data Entry Methods

Runtime Engine allows data entry in many different ways: keyboard entry, mouse entry or both. When a touch screen is installed, touch may be used to replace or supplement mouse entry. Light Pen or other pointing devices may also be used.

Note: Special Function 'Trigger Keys' on PDAs maybe associated with appropriate Macro commands.

Data Entry Using QuickPad

The InstantHMI QuickPad[tm] keypad facilitates convenient data entry (especially when a touch screen is provided but no keyboard is available). The appropriate QuickPad (Decimal, Hex, Binary, Alpha) pops-up depending on the data format specified for the data entry field. (Note: Starting with

version 6.1.7 B4016, we have updated CE QuickPad DLL to allow enter key from input panel keyboard and physical keyboard.)

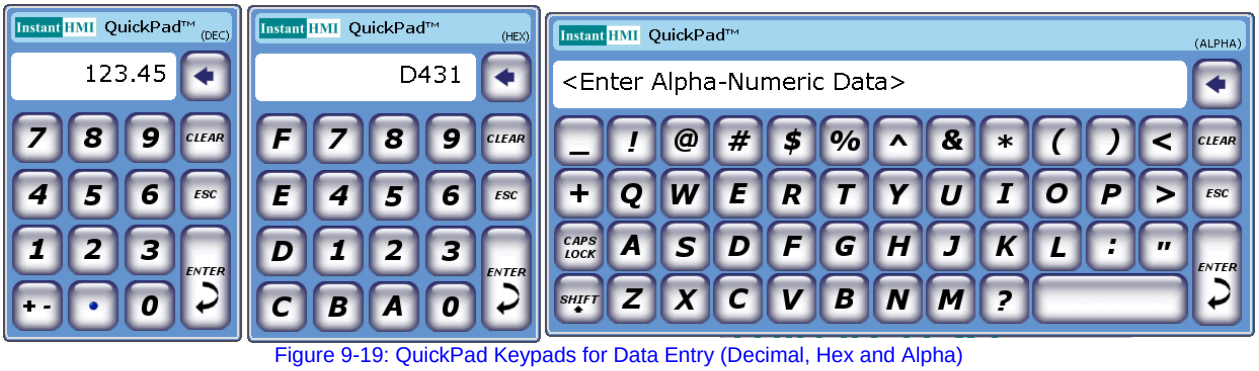


Figure 9-19: QuickPad Keypads for Data Entry (Decimal, Hex and Alpha)

Data Entry Using Keyboard Only

Switch to the desired screen by pressing its assigned macro key (usually F1, F2, etc. as defined in IHMI-MacroDB.idb) or by using the Screen command. Here, we assume that the screen you have selected has some data fields for User Input. Press the Update system key or the Tab key. The first user input data field will be highlighted. You can press the Tab key repeatedly to visit each of the user-input fields according to the Tabbing Order set for this screen (Section 4.9.1). You could also click the mouse on any data field to select it for data entry. You may enter new data in any of the user-input fields and press the Enter key to write your entry in the associated memory address. If you do not press the Enter key, data will not be written to the memory address. You may setup the Runtime to write the current field data value to its memory address when you use the Tab key to move to the next data entry field.

To enter numeric data use the numeric keys 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. If you make a mistake, use Backspace key. Use the <Enter> key to transfer the current field entry to the designated tag memory address.

Use the System Keys labeled YES/ON, NO/OFF, and TOGGLE BIT ON/OFF to enter data in fields which expect the boolean values YES/ON or NO/OFF.

Use any alpha-numeric key in fields where you are allowed to enter alpha-numeric data. In general, InstantHMI will ignore any keys that are disallowed (with a warning Beep if available on your system).

InstantHMI has a built in facility for checking if the data entered by the Operator is in a valid range. This feature for Checking Limits must be requested at screen creation time in Screen Designer (see Section 3.3.4).

Data Entry Using the TAB Key

By Default InstantHMI only writes data on the screen field to its associated memory address when a user hits the ENTER key on a field. This is to minimize data communication and ensure that the user only enters the desired data. In some cases it may be desirable for data to be entered when the TAB key is pressed (For example, applications where a lot of data need to be entered through the screen). To enable or disable this functionality you must define the following key in the [IHMIRT] section of your InstantHMI.INI file (Located in your Windows directory)

```
[IHMIRT]
DATA_ENTRY_ON_TAB=YES/NO
```

No matter what value you have for DATA_ENTRY_ON_TAB, pressing the Enter key on the current field will always enter data.

Note:

We strongly recommend that you do not change setup parameters directly in the 'Project.ini' file to avoid unpredictable or inconsistent runtime behavior. Use the Runtime Options dialog instead.
You may include a Macro Key (labeled as you wish, for example: 'Write Screen Data') and attach this key to the macro function ' Screen Write' discussed in Section 6.3.

Data Entry Using Mouse Only
InstantHMI allows any screen to be set up with Input Widgets, Buttons and Touch zones so that data entry (discrete and analog) can be done entirely with the help of a mouse without using the keyboard. All that is needed is the click of a mouse to press a button or touch zone or drag a slide or turn a dial or toggle a switch.

Data Entry Using Keyboard and Mouse
When your screen has usual integer or boolean data entry fields and also input widgets you may use the mouse to directly click on an input field (no need to go through the Tabbing Order) and enter your data.

User Feedback on Data Entry
To enable or disable this functionality you must ADD or CHANGE the following key in the [IHMIRT] section of your InstantHMI.INI file (Located in your Windows directory)

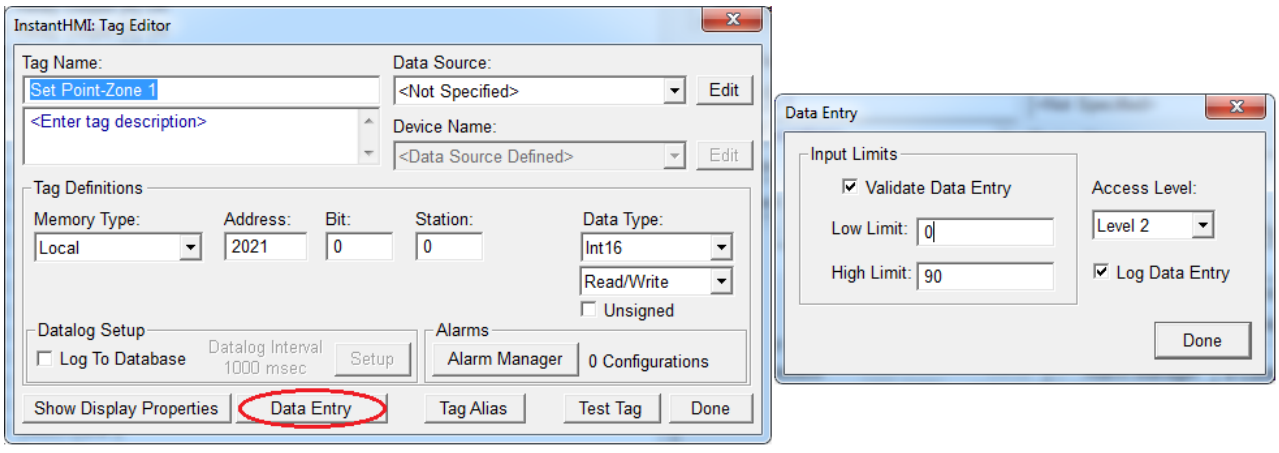
[IHMIRT]
BEEP_ON_DATA_ENTRY=YES/NO
When this key is set to YES, the runtime will beep when data is entered through the screen. By default, BEEP_ON_DATA_ENTRY is set to NO.

9.6.2 Data Entry Access

The relevant information from Section 4.11.1 is repeated here.

User Input Authorization and Log of Tag Data Entries
(Runtime Version 6.1.30 and later)

Each Tag in the Tag Database is assigned a Tag Access Level. The default Access Level is 1 (monitor only and no data entry allowed). Levels 2-10 allow control of user inputs. Tags can also be setup to Log Data Entry input changes in a log file.



The User Manager is used to assign Tag Access Levels (1-10) to each user. Only users with access level equal to or exceeding the Access Level specified for a tag will be allowed Data Entry input to change the associated tag value. To log all such changes, check the 'Log Data Entry' for all tags of interest and enable the Runtime setup option parameter 'LOG_DATA_ENTRY = 1'.

The Set Point-Zone 1 tag in the above example requires Access Level 2 (or higher) to allow set point changes. Two users 'Operator Level 1' (with Level 1) access and 'Operator Level 2' (with Level

2) access were setup for the standard Demo project. The Runtime (initially with Operator Level 2 logged in) was excercised introducing several Setpoint changes. Then Operator Level 1 logged in and any attempted Setpoint changes were verified to be disallowed. Reverting back to Operator Level 2 logged in again allows Setpoint changes. The input changes are recorded in the log file 'IHMI-DataEntryLog.csv'. This file may be opened in Microsoft Excel to view the log of data entries as shown below.

Date	Time	Operator Name	Tag Name	Old Value	New Value
7/1/2014	16:17:59	Operator Level2	Platform	0	1
7/1/2014	16:18:03	Operator Level2	Setpoint-Popup	0	1
7/1/2014	16:18:06	Operator Level2	Set Point-Zone 1	50	82
7/1/2014	16:18:12	Operator Level2	Set Point-Zone 1	82	81
7/1/2014	16:18:15	Operator Level2	Set Point-Zone 1	81	80
7/1/2014	16:18:20	Operator Level2	Set Point-Zone 1	80	61
7/1/2014	16:27:38	Operator Level1	Platform	0	1
7/1/2014	16:28:30	Operator Level1	Setpoint-Popup	0	1
7/1/2014	16:30:02	Operator Level2	Set Point-Zone 1	50	71
7/1/2014	16:30:05	Operator Level2	Set Point-Zone 1	71	42

9.7 Trending

InstantHMI allows you to include trend plots on screen (see Section 4.11.5).

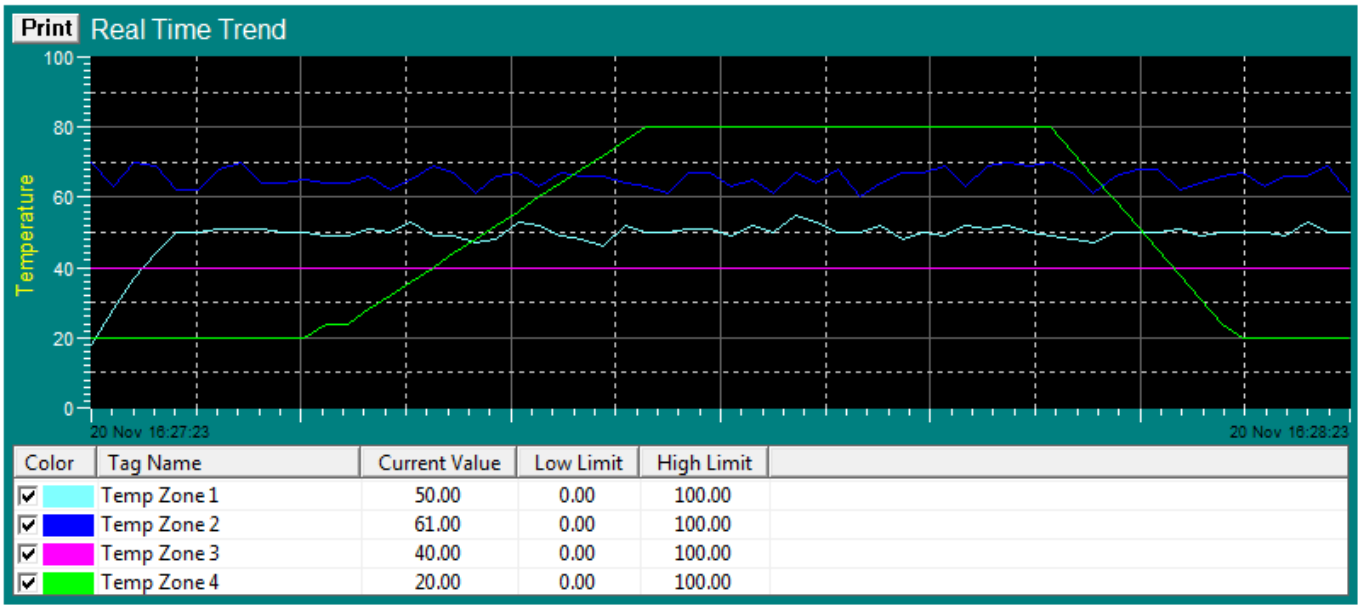


Figure 9-20: Sample Plot Screen (Trend)

Each plot can be located anywhere on screen and show up to sixteen trend variables per plot. At Runtime only the checked (check mark) pen traces will be displayed. This is convenient when multiple traces overlap and you wish to decipher a tag's trend clearly without overlap. You have control over the sampling rate and the trend window. You can have multiple plots on same screen. You will see in the Free Demo a screen like the one in Figure 9-20 showing a 60 sec trend of four variables sampled every second. You will also note that InstantHMI allows you to annotate the plot quite freely.

9.8 Watch Lists

The **Watch List** object allows you to monitor/modify tags from your Tag Groups at Runtime.

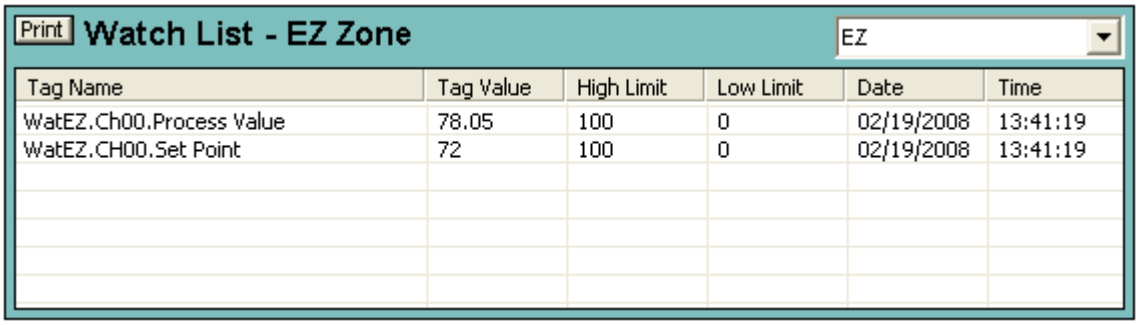


Figure 9-21: Watch List Object (in Runtime) Need New Fig

At runtime the same watch list can be used to 'watch' tags from any of the watch groups included in the pull-down list at the top. In addition, if the Tag allows data input, you may enter data through the watch list; just double click on the row where the input tag is listed and enter the new value.

9.9 Printing Reports

With InstantHMI you can print reports very easily and with utmost flexibility. Use Report Designer (see Section 5) to create the report templates. Review the discussion in Section 9.5 on the two system keys PRINT and SPOOL. Using these keys, the operator can print a variety of reports. The Operator can print on demand a report associated with any screen by pressing the PRINT function key. The report may include information from the displayed screen, some other screen, or any other information accessible from your PLC. Use of the SPOOL key in conjunction with the PRINT key can produce very flexible reports (see Section 5.3). Printer setup, if needed, will be done using Windows Control Panel.

9.10 Touch Screen

InstantHMI allows a mouse to activate touch zones on any screen (see Section 4.6.5). No touch hardware is necessary for this feature. If touch hardware is available the touch zones may be activated by touch.

9.11 Multiple Monitors

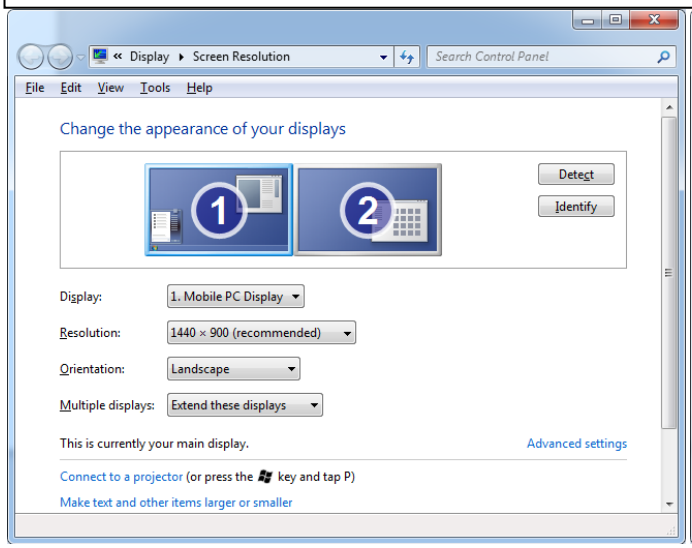
InstantHMI allows the use of dual monitors to extend the runtime display area. At present only two monitors are supported. The extension to dual monitors uses the standard multiple-display support in Windows. It is recommended that the Resolution of the two monitors are set to match each other and the design resolution of your project screens.

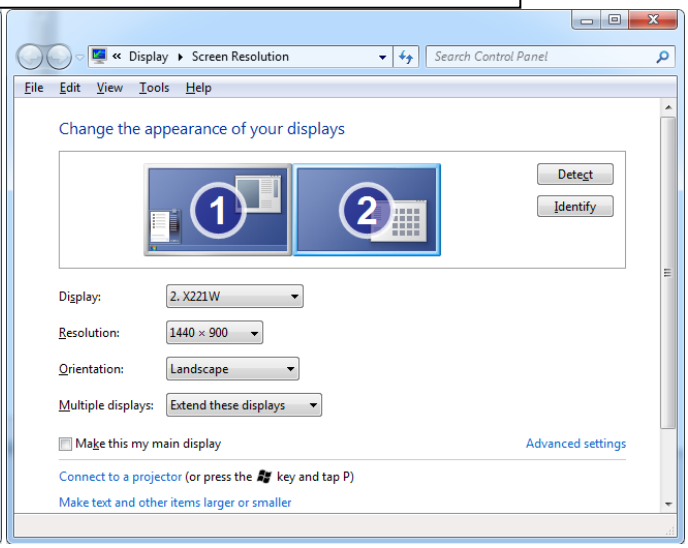
Setting Up Multiple Monitors in Windows
(You should look up Windows documentation for detailed instructions)

If you wish to use a second monitor (to view simultaneously two screens in InstantHMI Runtime) connect it to your PC. Right Click on Windows Desktop and in the pop-up menu select Screen Resolution. You will see the Windows Display --> Screen Resolution dialog.

Example dialog in Figure below shows 1. Laptop flat panel display and 2. External flat monitor display. Click on 'Monitor 1' to review its information (Display, Resolution, etc.). Note that for 'Multiple Displays' we have made the selection 'Extend These Displays'.

Click on 'Monitor 2' to review its information (Display, Resolution, etc.). Note that we have matched the Resolution to Monitor 1 Resolution and for 'Multiple Displays' we have made the selection 'Extend These Displays'.


Display ▸ Screen Resolution
Search Control Panel
File Edit View Tools Help
Change the appearance of your displays
Detect
Identify
Display: 1. Mobile PC Display
Resolution: 1440 × 900 (recommended)
Orientation: Landscape
Multiple displays: Extend these displays
This is currently your main display.
Advanced settings
Connect to a projector (or press the key and tap P)
Make text and other items larger or smaller


Display ▸ Screen Resolution
Search Control Panel
File Edit View Tools Help
Change the appearance of your displays
Detect
Identify
Display: 2. X221W
Resolution: 1440 × 900
Orientation: Landscape
Multiple displays: Extend these displays
Make this my main display
Advanced settings
Connect to a projector (or press the key and tap P)
Make text and other items larger or smaller

The use of dual monitors in InstantHMI is simplified with the following implementation: The Title Bar, Menu Bar and Status Bar are extended to span across the dual monitors. With Multiple Monitor Enabled, the recommended settings are as follows:

Parameter Name	Parameter Key	Parameter Values	Project.ini Section
Multiple Monitor Support		1 (Enable)	[IHMIRT]
Title Bar		1 (Enable)	[IHMIRT]
Menu Bar		0 (Disable)	[IHMIRT]
Status Bar		0 (Disable)	[IHMIRT]
Screen Resolution		1 (Fit to Monitor)	[IHMIRT]

With 'Multiple Monitor Support' enabled, the runtime defaults the screen resolution to be 'Fit to Monitor' if 'As Designed' is the current selection. When the Runtime starts, Monitor 1 will show the Screen 1 in its view and Monitor 2 will show Screen 2 in its view. You can navigate to display any project screen in the 2 monitors independent of each other. The position of the mouse cursor (monitor 1 or monitor 2) will determine the screen that will accept the key strokes for keyboard input.

9.12 Communications Errors

For the purpose of trouble-shooting communication error codes are listed below. If you see any error codes on the status line the following table may be helpful.

Runtime Error Codes			
-1	General Error	-17	Framing Error

-2	Mismatch Error	-18	Parity Error
-3	Transmit Time Out	-19	Data Over Run
-4	Receive Time Out	-20	Device Busy
-5	General Communication Error	-21	Command Error
-6	Sum Check, CRC, etc. Error	-100	Unknown Error
-7	Request Error	-101	TCP/IP Connection Failed
-8	Response Error	-102	Unable to locate device
-9	Invalid Address	-103	Invalid Path
-11	Bad Command	-104	General Timeout
-10	Invalid Bit Number	-105	No Response Pending or Returned length of 0
-12	Command Disabled	-106	Bad Path
-13	Message Restarted	-107	Node Not Present
-14	Data Terminated Early	-108	Node Not Found
-15	Data Ended Early	-109	No global data present
-16	Break in Data	-110	Invalid Path Specified in InstantHMI.ini file

InstantHMI also records the communication statistics in the file IHMI-CommStat.LOG. If you have any problems with communications with your PLC you may inspect the IHMI-CommStat.LOG file (see example in Figure 9-22) by clicking the Status button on the LaunchPad. The profile string CommStat in InstantHMI.INI file in your Windows Directory controls logging in IHMI-CommStat.LOG. COMMMSTAT = NEW, starts logging in a new COMMSTAT.LOG file (archiving the old data in a file COYYMMDD.LOG where YY, MM, DD denote the year, month and date. COMMSTAT = APPEND, appends new data to the existing IHMI-CommStat.LOG file.

InstantHMI Communication Log

Port ID	Date	Start time	End time	Total Comm Attempts	Total Errors	Timeouts Recv	Timeouts Send	General Errors
0	10/07/93	09:08:26a	09:09:59a	1430	0	0	0	0
0	10/07/93	09:11:08a	09:16:00a	4282	0	0	0	0
0	10/07/93	09:16:00a	09:21:00a	4376	0	0	0	0
0	10/07/93	09:21:00a	09:22:12a	1059	0	0	0	0
0	10/19/93	10:32:52	10:33:25a	760	4	0	0	4
0	10/19/93	10:47:07a	10:50:18a	2730	1	0	0	1
0	10/19/93	10:56:18a	10:59:50a	2843	19	0	2	17
0	10/19/93	11:00:54a	11:01:10a	143	0	0	0	0

Figure 9-22: sample Communication Statistics

10 Runtime Engine (CE and PDA)

InstantHMI LaunchPad (Section 2) allows you to design your HMI project on a Windows PC platform, and deploy it on any Windows PC, or Windows CE, or PDA (Windows Mobile or Pocket PC or Smartphone) platform, which has an installed InstantHMI Runtime Engine (typically installed on a suitable memory card such as CF, or SD, or mini-SD, or micro-SD). In Section 9 we discussed Runtime Engine on PC platforms. In this Section we discuss Runtime Engines for PDA and Windows CE platforms.

The Runtime for the CE and PDA platforms are very similar in terms of functionality. Although InstantHMI provides most of the PC Runtime functionality on Windows CE and PDA platforms, there are unique platform characteristics which make the CE/PDA Runtime differ from PC Runtime. Windows CE platforms tend to be touch panels mounted near the action (panel mount) and more often have very specific (more often limited) control and monitoring requirements. PDAs have a distinctly different 'Instant On, Ready to Go' philosophy in addition to special features such as barcoding, GPS and built-in wireless links, and tend to be used intermittently and on-the-Go. InstantHMI Runtime Engines for PDAs support this philosophy inherently by providing various features that can be configured or modified instantly (in addition to usual screens that you design using the LaunchPad).

If InstantHMI runtime engine is not installed in your Pocket PC or Windows CE platform do so now (Appendix A lists compatible hardware and describes the installation procedure). Turn on the PDA or CE hardware, tap on the InstantHMI icon with your stylus to run InstantHMI Runtime Engine (referred to as IHMI for short). If you have not registered the software with Software Horizons please do so now (Appendix A).

Note: For CE/PDA Runtime Engine choose Project Initialization parameter to reduce startup time when there are many screens in the project (Section 9.4).

Project Initialization	RUNTIME_READ_ALL_SCREEN	0 (First Screen Only) 1 (All Screens)	[IHMIRT]

10.1 PDA and CE Platform Familiarity

PDA

We assume that you will review the documentation for your PDA, and achieve sufficient familiarity with the use of the PDA and its useful functions. A book (such as, 'How to do Everything with Your Pocket PC', published by Osborne) may serve as a useful tool to become familiar with your PDA. You should at least familiarize yourself with the '**ActiveSync'** feature of the PDA. 'ActiveSync' operation only ensures that all your personal data in your Pocket PC is backed up on your PC. You may use ActiveSync with your desktop PC to restore all data that was 'backed up' during the previous ActiveSync operation. ActiveSync does **not** back up InstantHMI files (and other program files) not stored in the Synchronized Files Folder. We recommend that you use the InstantHMI LaunchPad Designer for convenient backup and restoration of InstantHMI project and data files.

Windows CE

We assume that you will review the documentation for your Windows CE (5.0 or higher) computer and achieve sufficient familiarity with its useful functions. You may use your desktop PC to restore all data that was 'backed up'. If you have the InstantHMI LaunchPad option installed then you can use it for convenient backup and restoration of InstantHMI project and data files.

InstantPanel® from Software Horizons Inc. is a Windows CE touch panel with InstantHMI software preinstalled and ready to go. You may access InstantHMI by double-tapping the 'InstantHMI Icon' on the InstantPanel Desktop. Alternatively, you can double-tap the 'My Computer' Icon on the desktop, navigate to the ResidentFlash → InstantHMI folder, and double-tap the InstantHMI Icon (IHMI.EXE).

Note: Earlier versions (prior to 6.1.21) provided built-in pre-formatted setup screens to allow for quick changes at the machine, if necessary, for CE platforms and let PDAs take advantage of the various built-in screens without prior project design for quick 'what-if' trials and analysis. Starting with 6.1.21 the CE/PDA runtime versions resemble the PC runtime more closely. We have implemented a Mini-LaunchPad for the CE platform (Section 2.7).

Earlier versions (prior to 6.1.27) installed all Project files in the same folder as the Program files. Starting with 6.1.27 the CE/PDA runtime versions resemble the PC runtime more closely and support the concept of a Project. The current project files are installed in the specially named 'Project' folder, which is a sub-folder of the installation folder where the Program files are installed. This allows you to maintain multiple named project folders, one of which will be copied into the current 'Project' folder used by the Runtime. The PC LaunchPad will deploy to current "Project" folder if version 6.1.27 or greater is detected in registry of PPC/CE device.

10.2 Runtime Main Menu

When InstantHMI is running you will see the 'startup' project screen. (OEM versions of InstantHMI can be customized with special startup screens. Contact Software Horizons for details on OEM screens to suit your customers' application needs).

On any screen, you may right click ('tap and hold') to pop-up a menu of runtime functions:

About	Version Info	Registration
Setup	Barcodes	Datalogs
Alarm Monitor		
Barcode Viewer		
Troubleshoot		
Login/Logout		
Exit		

The **Menu** consists of 7 options which provide access to the powerful features in InstantHMI described below.

10.2.1 About InstantHMI

When you tap on the **About** menu you will have two options: Version Info and Registration, which will pop-up one of the following dialog boxes.

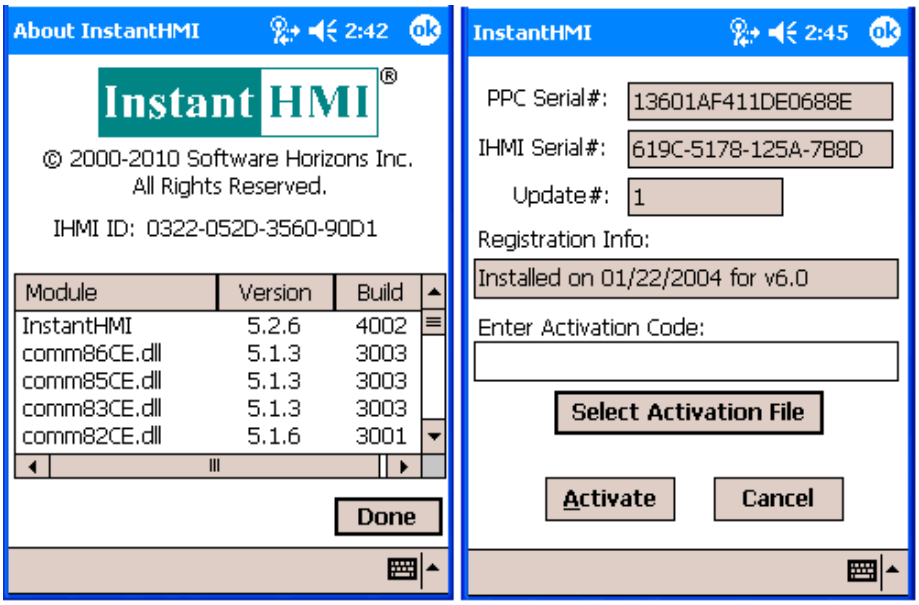


Figure 10-1: About InstantHMI: Version Info and Registration (PDA)

Version Info

Tap on **Version Info** in the Menu to see the version and build details to identify the driver and program versions about your InstantHMI installation. This screen provides important information to

help Software Horizons Technical Support staff to identify and correct any problems you may experience.

Registration

Tap on **Registration** to review your registration information. You will need to provide the PPC Serial#, IHMI Serial# and the Update # when requesting a License Activation Code from Software Horizons. When you receive the Activation Code in a file click on Select Activation File and navigate to the activation file. Alternatively, Enter Activation Code provided by Software Horizons in the entry field. Tap on Activate button if you are entering (from file or manually) the Activation Code, otherwise tap on Cancel button to return to your screen.

10.2.2 Setup

When you tap on the **'Setup'** menu you will see two choices to access corresponding functions: Barcodes, and Datalogs.

Barcodes

Tap on the **'Barcodes'** menu to access the Barcode Setup Screen. The Barcode Input function can be used if InstantHMI with barcoding option is installed on a PDA equipped with a barcode scanner (such as Symbol PPT28xx), which may be plug-in module using the CF/SD card slot in the PDA. With a plug-in module, you may click the 'Set Scan Button' and then press the function button on the PDA that you wish to use for barcode scan. (If the button is not detected, you will see the message 'No Button Selected'. In this case, repeat once or twice before assuming button is not detected, or try a different button, if feasible.) Click 'Transfer Barcode' and then assign a tag to capture the barcode string read. Select number of consecutive registers at this tag address, to fit the barcode string length (2 characters per 16-bit register). In addition, you may also select the byte order to match your scanner characteristics. Setup a handshaking tag in your controller to signal when a new barcode has been scanned.

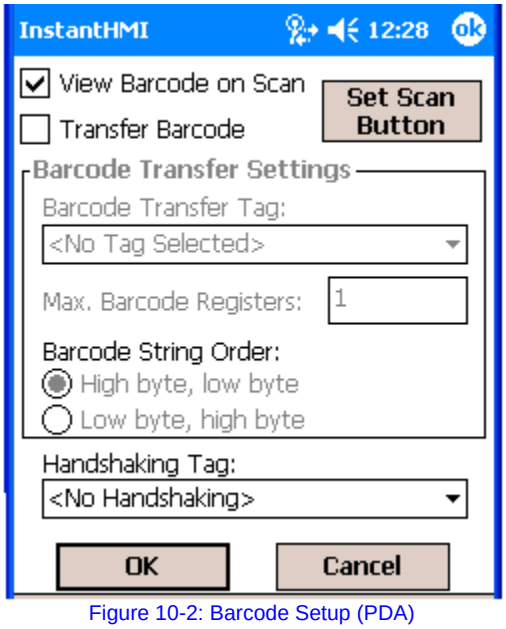


Figure 10-2: Barcode Setup (PDA)

Data Logging

Data Logging is an available optional feature in InstantHMI. You can access it by tapping on the **Data logging** menu option (See Section 10.4 for details).

10.2.3 Alarm Monitor

See Section 17.5.

10.2.4 Barcode Viewer

See Section 10.3.3 .

10.2.5 Troubleshoot

The **Troubleshoot** Menu leads to an interactive selection of System Components (Display, Communication, Outputs, Alarms, Control, and Errors) and the Observed Symptoms (Indication). This displays a small subset of Probable Causes for you to select so that you may focus on the corresponding Corrective Actions displayed on the PDA. The InstantHMI LaunchPad software provides a Troubleshooting Editor which can be used to set up the Troubleshoot scheme (from scratch) to suit the individual end user application requirements (see Section 2.3.2).

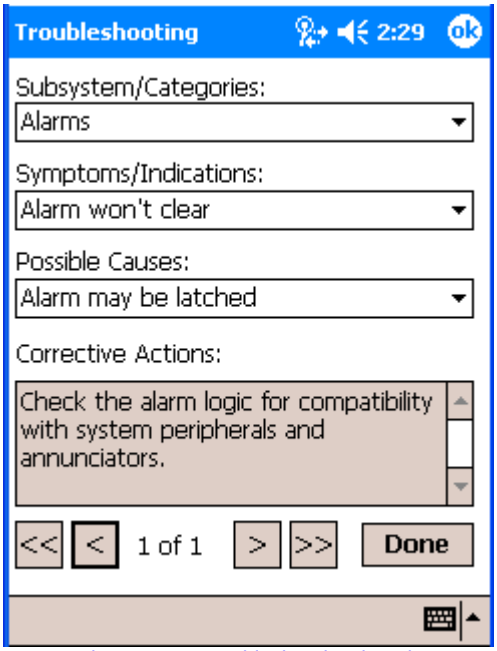


Figure 10-3: Troubleshooting (PDA)

10.2.6 Login / Logout

The Login/Logout menu option appears only if User Manager is enabled (in LaunchPad while setting up the CE/PDA project). This option was originally reserved for use with 'special OEM implementations' from Software Horizons.

Example OEM Login implementation: Tap on the **Login** button and then tap on the User Name field so you can enter your User Name. Similarly, enter your Password and tap OK. A valid User Name and Password are required to access any of the functions on the Main Menu. Without logging in you may only access 'About', ~~'Help'~~ and 'Exit'.

To prevent unauthorized access you may **Logout** if you are leaving the PDA unattended; this will permit the data logging and other background activity to continue uninterrupted. If there is no user activity detected for a specified time (30 Sec – 10 Min) the system will automatically enter the Logout State where data entry and monitor screens are hidden from unauthorized users by a 'Resume Screen' (similar to a Screen Saver). To return to your InstantHMI application screens tap on the 'Resume' button and enter your Password (The Administrator with a higher level password may resume any suspended InstantHMI operation).

10.2.7 Exit

The **Exit** Menu allows authorized users to exit the InstantHMI application program. You may then access other applications on the PDA using the Start menu or turn off the power on the PDA. (Also see Section 9.4.11).

When exiting (example: tapping X button in upper right hand corner of CE Runtime) the password is requested if the user manager is enabled (in LaunchPad while setting up the CE/PDA project).

10.3 Data Monitoring

InstantHMI has built in communication driver to directly interface with your controller. The list of drivers supported is included in Appendix C. Make sure the version of InstantHMI installed on your PDA supports your controller. Connect the appropriate communication cable from the controller to the serial port on the PDA, or use the wireless link (Wi-Fi or Bluetooth). See details for your driver in Appendix C.

10.3.1 Pre-formatted Screens

Starting with version 6.1.21, legacy PDA-specific features such as Tag Monitor Screen, Trend Graphs and Bar Graph have been eliminated. The PDA and CE projects will be designed in the LaunchPad and deployed to the target platform. If any special features are desired contact Software Horizons to discuss how they may be included in a special OEM implementation for you.

Example OEM implementation: InstantHMI has a built-in **Screen Protection**, which super-imposes a 'Resume Screen' to hide any monitor / data entry screens, after some specified period of operator inactivity (30 secs – 10 Min). Screen Protection can be disabled if you so desire. When the Resume Screen appears, a valid password must be entered to resume normal InstantHMI screen functionality. The PDA's **Auto Power Off** feature may be prevented to let InstantHMI continue monitoring and data logging.

10.3.2 Graphic Monitor Screens (Designed by You)

InstantHMI Runtime starts with the 'startup' screen for your project. You should provide (navigation) Macro buttons on your project screens to switch from one project screen to another. Tap and hold on your screen to pop-up a menu allowing you to select available choices including Alarm Monitor Screen.

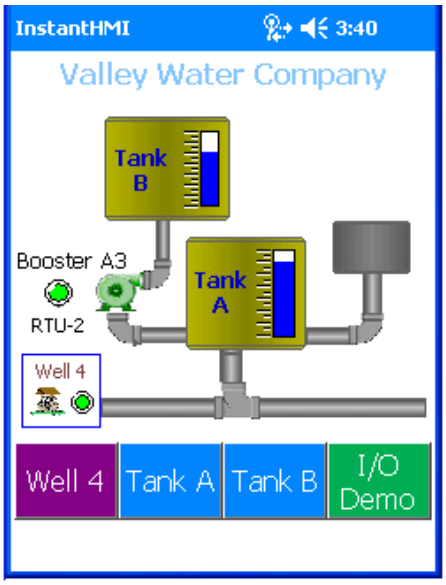


Figure 10-4: Data Monitor → Screen Monitor (Project Screen on PDA)

10.3.3 Bar Codes

The Barcode Input function can be used if InstantHMI with barcoding option is installed on a PDA equipped with a barcode scanner (such as Symbol PPT28xx).Bar Codes can be scanned and stored in the PDA. They may also be transferred to a controller connected to the PDA using a serial or wireless RF link with InstantHMI acting as a 'go-between'.

Figure 10-5: Wireless Barcode Transfer Example (PDA)

The Barcode Setup screen allows you to specify whether you wish to transfer the scanned barcode to the controller registers (Max # barcode consecutive registers starting with the address specified in Barcode Transfer Tag). You may also setup a Handshake Tag, which InstantHMI can use to 'signal' the controller by setting the handshake register (value = 1) when a new barcode was scanned. The controller can reset this handshake register (value = 0) when it has processed the barcode and is ready for the next barcode reading. In addition, you may select how to store the barcode string in the controller (High Byte first or Low Byte first) and whether to switch to the Barcode viewer screen when the 'trigger' on the PDA is pressed to scan in a new barcode.

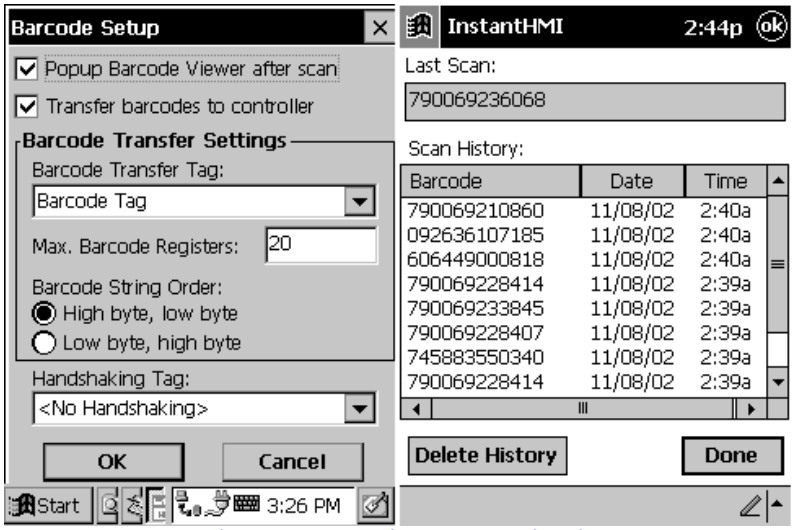


Figure 10-6: Barcode Scan Setup (PDA)

The Barcode Viewer screen shows the Scan History of the scanned barcodes as well as the most recent (Last) barcode scan. Tap on the Delete History button to delete the barcodes from the Log.

10.3.4 Communication Errors

Runtime Error Codes			
-1	General Error	-17	Framing Error
-2	Mismatch Error	-18	Parity Error
-3	Transmit Time Out	-19	Data Over Run
-4	Receive Time Out	-20	Device Busy
-5	General Communication Error	-21	Command Error
-6	Sum Check, CRC, etc. Error	-100	Unknown Error
-7	Request Error	-101	TCP/IP Connection Failed
-8	Response Error	-102	Unable to locate device
-9	Invalid Address	-103	Invalid Path
-11	Bad Command	-104	General Timeout
-10	Invalid Bit Number	-105	No Response Pending or Returned length of 0
-12	Command Disabled	-106	Bad Path
-13	Message Restarted	-107	Node Not Present
-14	Data Terminated Early	-108	Node Not Found
-15	Data Ended Early	-109	No global data present
-16	Break in Data	-110	Invalid Path Specified in InstantHMI.ini file

When communication errors occur InstantHMI may display any of the above error codes. These codes may be helpful in understanding and mitigating the cause of the errors. The errors are logged in IHMI-CommErrorLog.txt and IHMI-CommStat.log.

Note: Ihmi-CommErrorLog.txt will be purged at each startup of InstantHMI Runtime.

10.4 Data Logging

Data Logging is an available optional feature in InstantHMI. As discussed in Section 3.7, two types of data logging may be supported on your platform: Time based data logging and Event triggered data logging.

For Time Based Data Logging, any tags from the tag database may be assigned a Datalog Sample Time (Section 3.3.7).

You may think of event triggered Data Logging as the response to the following statements:

If (Event1) then datalog (Tag List1),
If (Event2) then datalog (Tag List2), etc.

10.4.1 Datalog Manager

Tap the **Add Tag** button, to include any selected tag data items defined from the Tag database in the data log tag list for logging in the PDA at specified sample times. Tap the Remove Tag button to delete an item from the data log tag list. Tap the Done button to leave the Data Log Manager screen. You may tap the **Start / Stop** button to start / stop the logging of data in the PDA. (If the button label shows ‘Stop’, you may tap it to stop data logging in progress. If the button label shows ‘Start’, you may tap it to start data logging). Tap Delete All Logged Data to delete all logged data from the database.

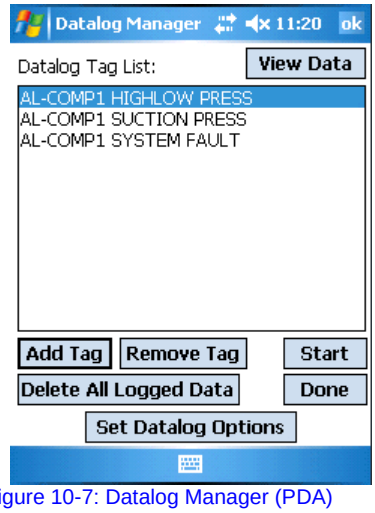


Figure 10-7: Datalog Manager (PDA)

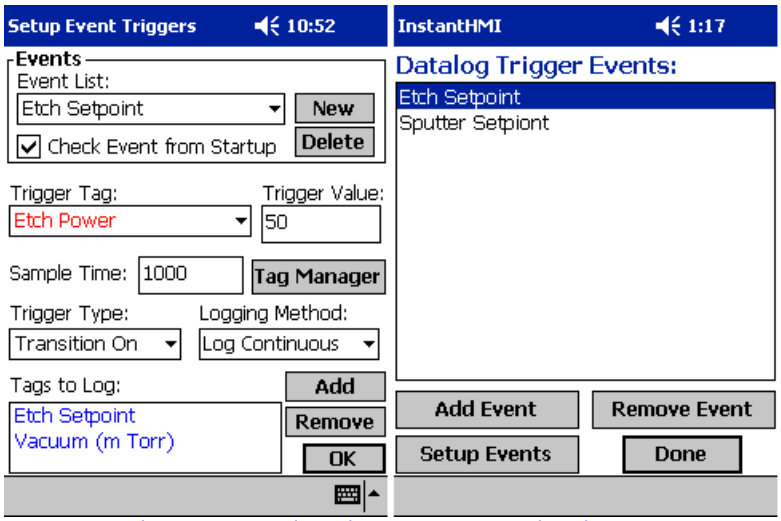


Figure 10-8: Datalog Trigger Events Setup (PDA)

10.4.2 Datalog Viewer

To View the logged data, tap on the **View Data** button on the Data Log Manager screen. You will see a scrollable table listing the data logged for the selected tag. Tap the pull down list of Tags to select a tag from the list of tags for which data has been logged. Use the scroll bar on the right to browse through the table (tapping the arrow scrolls the table one line at a time, tapping the scroll bar scrolls the table one page at a time). Tap the **Delete Tag Data** button to delete the logged data for the selected tag. Tap the **Done** button when you are done viewing the data log.

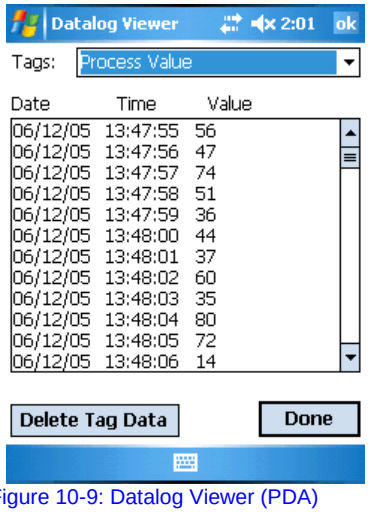


Figure 10-9: Datalog Viewer (PDA)

10.4.3 Data Logging Example

For example, suppose you have a tag called Temperature with a high value THigh and a low value TLow and you wish to log Temperature values if it is in high alarm condition (Temperature > THigh) or in low alarm condition (Temperature < TLow). You define Event1 with Trigger Tag as Temperature and Trigger value = Thigh, Trigger Type = Transition On, Datalog Type = Log Continuous, and include Temperature tag in the datalog tag list. You also define Event2 with Trigger Tag as Temperature and Trigger value = TLow, Trigger Type = Transition Off, Datalog Type = Log Continuous, and include Temperature tag in the datalog tag list. Finally, you choose both Event1 and Event2 as Datalog Trigger Events. This will ensure that the tag Temperature will be logged whenever it is in alarm condition.

The logged data may be transferred to a desktop PC (using the InstantHMI LaunchPad). The logged data can then be subjected to analysis using Microsoft Excel, or other tools available to you. InstantHMI provides the capability to view logged data on a Trend History plot as discussed in Section 13.

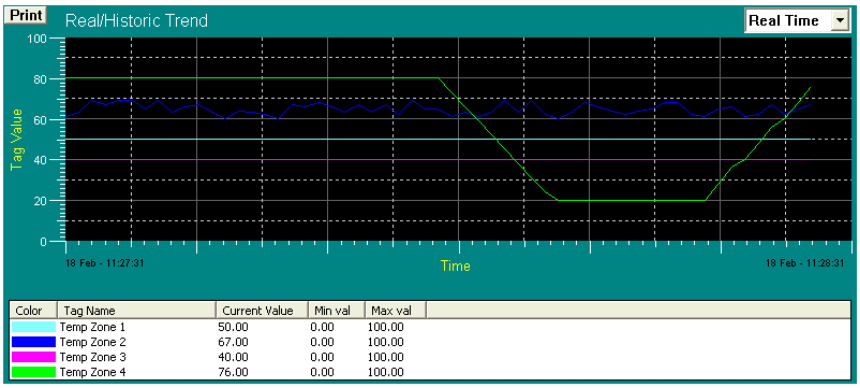


Figure 10-10: Trend History (PDA)

10.5 Data Entry in Runtime

Runtime Engine on a PC allows data entry in many different ways: keyboard entry, mouse entry or both. When a touch screen is installed, touch may be used to replace or supplement mouse entry. Light Pen or other pointing devices may also be used. A PDA has a built-in touch screen, a tiny soft-key pop-up keyboard and a stylus used for tapping on the touch screen. To make data entry more convenient in a PDA InstantHMI provides the QuickPad^{tm} pop-up soft keypad.

Switch to the desired screen on the PDA using the stylus to tap on touch zone buttons or Screen menu choices. Here, we assume that the screen you have selected has some data fields for User

Input. Tap on the edit area of the data field. Depending on the data format of the input field (Decimal Integer, Alpha, Hex, Binary) the appropriate QuickPad keypad will pop-up. Tap on the large keys provided to enter data. To enter numeric data use the numeric keys 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. If you make a mistake, use Backspace key. Use the <Enter> key to transfer the current field entry to the designated tag memory address. Tap on the ESC key to cancel the entry and return to the data field on your screen.

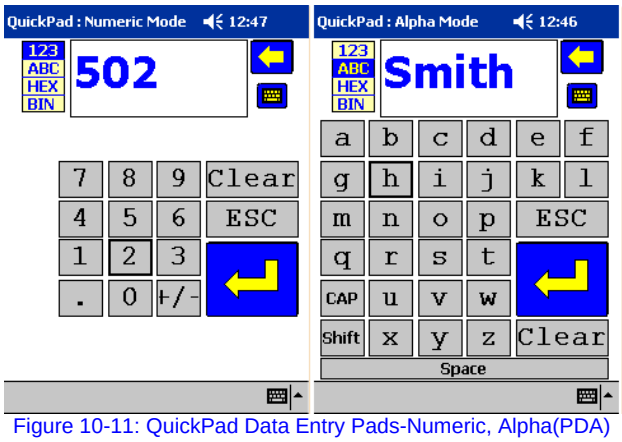


Figure 10-11: QuickPad Data Entry Pads-Numeric, Alpha(PDA)

If the QuickPad keypad shown is not what you want, tap on '123', or 'ABC', or 'HEX', or 'BIN' to switch to the Integer, or Alpha, or Hex, or Binary keypad. Tap on the 'keyboard' icon if you need the full keyboard provided by the PDA operating system. You will notice that the QuickPad keys are much larger than the PDA's keyboard; and in addition, only the relevant keys are displayed to make data entry even easier.

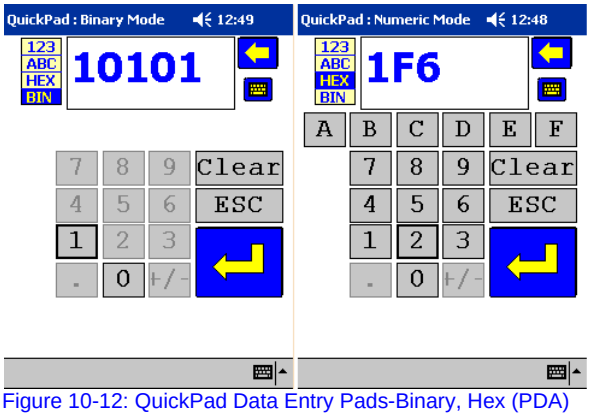


Figure 10-12: QuickPad Data Entry Pads-Binary, Hex (PDA)

InstantHMI has a built in facility for checking if the data entered by the Operator is in a valid range. This feature for Checking Limits must be requested at screen creation time in Screen Designer (see Section 3.3.3).

Note: You may include a Macro Key (labeled as you wish, for example: 'Write Screen Data') and attach this key to the macro function ' Screen Write' discussed in Section 6.3.

Data Entry Using Stylus Only

InstantHMI allows any screen to be set up with Input Widgets, Buttons and Touch zones so that data entry (discrete and analog) can be done entirely with the help of a mouse without using the keyboard. All that is needed is the tap of the stylus to press a button or touch zone or drag a slide or turn a dial or toggle a switch.

Data Entry Using Keyboard and Stylus

When your screen has usual integer or boolean data entry fields and also input widgets you may use the stylus to directly tap on an input field and enter your data.

10.6 Printing Reports

With InstantHMI you can print reports very easily and with utmost flexibility. Use Report Designer (see Section 5) to create the report templates. Review the discussion in Section 9.5 on the two system keys PRINT and SPOOL. Using these keys, the operator can print a variety of reports. The Operator can print on demand a report associated with any screen by pressing the PRINT function key. The report may include information from the displayed screen, some other screen, or any other information accessible from your PLC. Use of the SPOOL key in conjunction with the PRINT key can produce very flexible reports (see Section 5.3). Printer setup, if needed, will be done using a pop-up printer setup dialog.

InstantHMI supports printing from PDA and CE platforms using Bluetooth, Infrared, WiFi, network and serial links. Printing support is available for all ARM CE platforms but not for x86 CE platforms. Text and graphic bitmaps may be printed. Contact Software Horizons with your portable PDA or CE platform based printing requirements and a quote for complete printing solution.

11 TCP/IP Interface,SHIP Protocol and GoToMyHMI

11.1 Introduction

TCP/IP is a network communication protocol that allows nodes (computers and other devices) on an Ethernet network to exchange information among them. TCP/IP can be used in a LAN (Local Area Network) or through the Internet. There are other application level protocols (such as HTTP, HTTPS, FTP, FTPS, SFTP, and our own SHIP) which utilize TCP/IP to implement additional application level functionality. InstantHMI implements SHIP Protocol (Software Horizon's Inter-node Protocol), which allows the transfer of data between InstantHMI nodes (PC, PDA or Windows CE) across the room or across the world. GoToMyHMI uses HTTPS (secure Hyper Text Transfer Protocol) and SFTP (Secure File Transfer Protocol) in its implementation of the 'HMI-Gateway in the Cloud' to allow access to InstantHMI nodes from any device (with a standard browser) anywhere in the world.

11.2 InstantHMI Client/Server Networks and SHIP Protocol

InstantHMI's SHIP Protocol allows the transfer of data between InstantHMI nodes (PC, PDA or Windows CE) across the room or across the world. The node providing the data is called a Server node and the node requesting and receiving data is called a Client node. The Server can be a PC or CE node (PDA node as a Server does not make practical sense); the Client can be a PC, CE or PDA (including SmartPhone) node.

For illustrative purposes, we show below three InstantHMI configurations for TCP/IP networking. Many other configurations are, of course, possible. Using these examples as a guide you can configure InstantHMI to exchange information among InstantHMI nodes. This can be used, for example, if you need to transfer data from one PLC to another that are at different sites, or to use InstantHMI node as a 'Gateway' to transfer data from one type of PLC (model 'A') to another (model 'B') at a remote location.

11.2.1 PC accesses Controller data over Internet

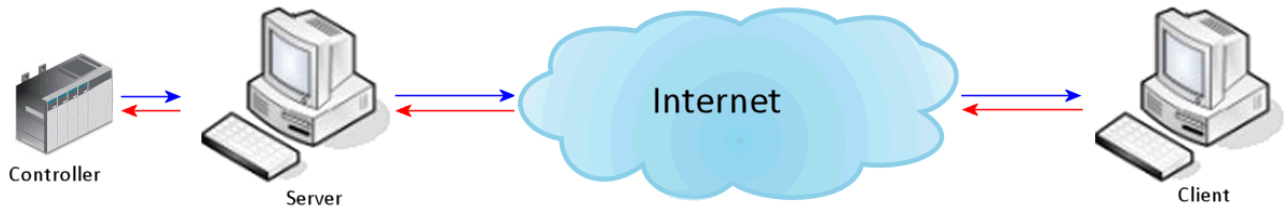


Figure 11-1: InstantHMI Client/Server TCP/IP link over Internet

Figure 11-1 shows one InstantHMI node (Client) connected through the Internet to another InstantHMI node (Server) connected to and communicating with a Controller. The client node can view and modify data in the Controller (connected to the server node) across the Internet.

11.2.2 PC accesses Controllers connected to multiple PCs over LAN

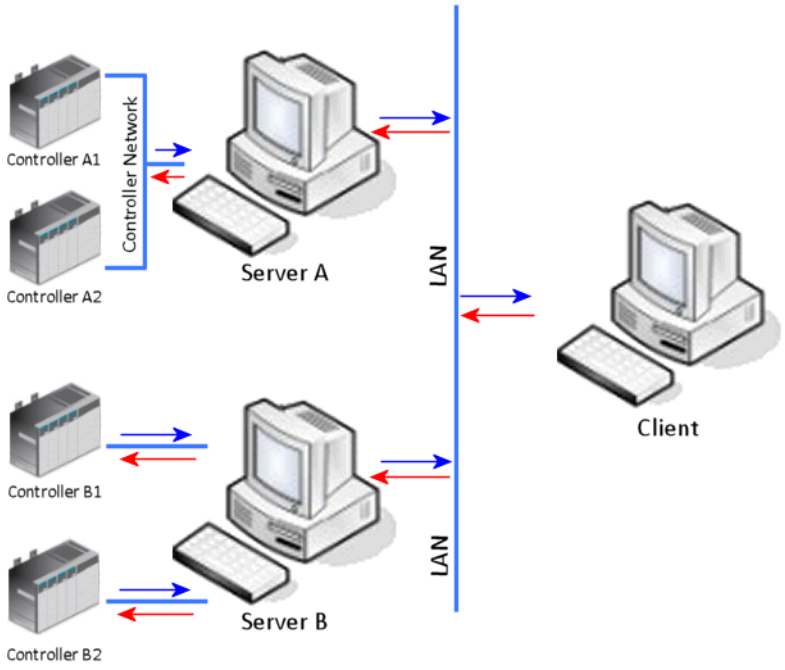


Figure 11-2: InstantHMI Client/Server TCP/IP links over LAN

Figure 11-2 shows a more common configuration. We have an InstantHMI node (Client) viewing and/or modifying data from multiple InstantHMI server nodes each connected to a network of Controllers. This allows the Client Node to read and/or write data to the attached controllers of the server nodes.

11.2.3 InstantHMI TCP-IP Client Server Network

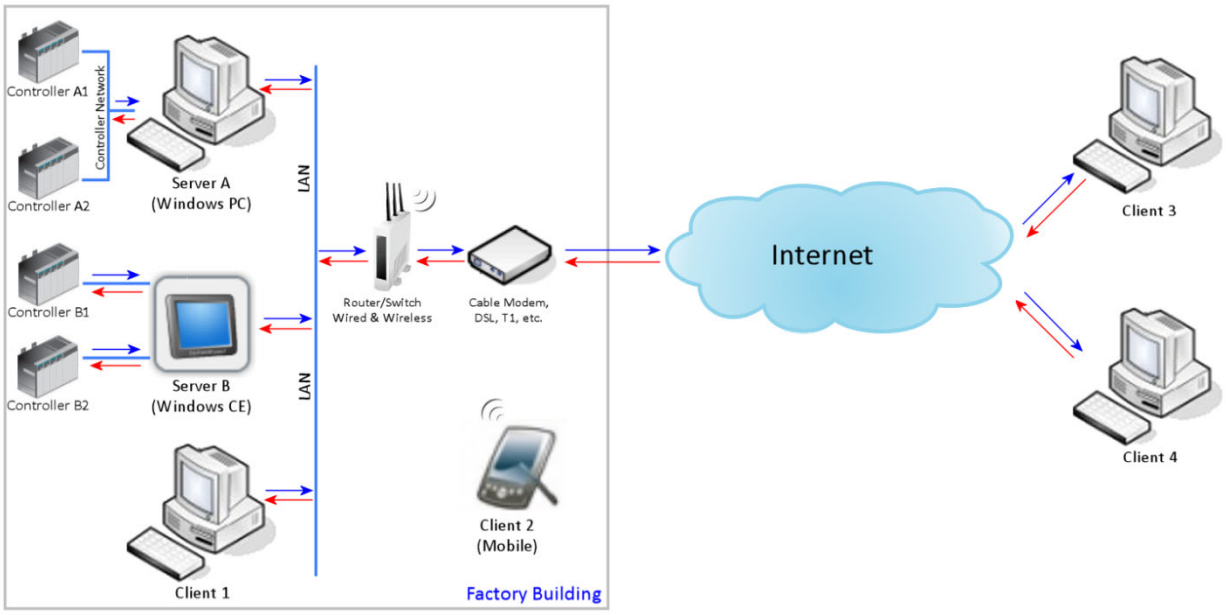


Figure 11-3: InstantHMI TCP-IP Client Server Network

Figure 11-3 shows a more comprehensive configuration including multiple server platforms (PC and CE), multiple clients (PCs over Internet, PC over LAN and wireless Mobile). We have multiple

InstantHMI Client nodes viewing and/or modifying data from multiple InstantHMI Server nodes each connected to a network of Controllers.

11.3 GoToMyHMI: HMI-Gateway

In Section 11.2 we described several Client-Server scenarios in which InstantHMI Runtime Engines may be used. Here we show briefly how 'Cloud Ready' InstantHMI Servers may be used in exciting new scenarios facilitated by the GoToMyHMI Services (Details are described in a separate document 'GoToMyHMI: HMI-Gateway').

11.3.1 Cloud Nodes access InstantHMI Server via GoToMyHMI

Figure 11-4 shows a single InstantHMI server setup to be accessible from the Internet via the Cable Modem and Router path from the LAN. GoToMyHMI serves as a HMI-Gateway in the cloud and provides multiple Cloud Nodes independent access to the InstantHMI Server Project simultaneously. That is, GoToMyHMI presents any 'Cloud Ready' InstantHMI Runtime Server in the Cloud so that any authorized User of GoToMyHMI Service may remotely access the InstantHMI Server with a standard browser on any device ('Cloud Nodes'). "**Cloud Node**" means a suitable hardware platform running a compatible standard web browser session, which is used to Log into GoToMyHMI by the User authorized to access the GTMH/Services. A logged in User and a Cloud Node have a one to one correspondence. The number of Cloud Nodes supported depends on your InstantHMI license as well as practical considerations based on your system installation.

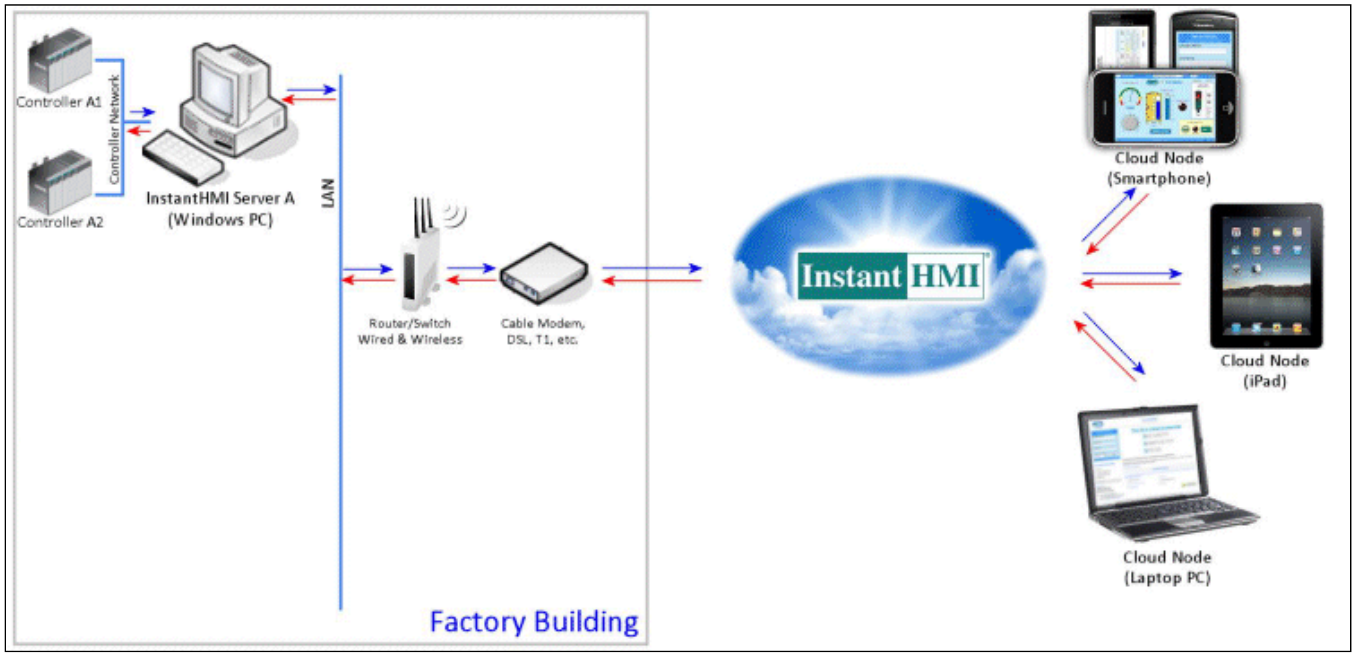


Figure 11-4: InstantHMI Server access from Cloud Nodes using GoToMyHMI Gateway

11.3.2 Servers, Clients and Cloud Nodes in Perfect Harmony

Figure 11-5 shows a fairly comprehensive setup of InstantHMI Servers, Clients and Cloud Nodes. Not shown in Figure 11-5 are remote clients – not Cloud Nodes - with InstantHMI Runtime installed, which access the Server(s) over the Internet. The Clients shown behind the firewall in the Factory Building access the InstantHMI Servers over the LAN or Wi-Fi connection using wired/wireless Router or Switch. The remote Cloud Nodes (iPad, iPhone, Android, BlackBerry, and Laptop PC) access the InstantHMI Servers behind the firewall using the secure GoToMyHMI Gateway.

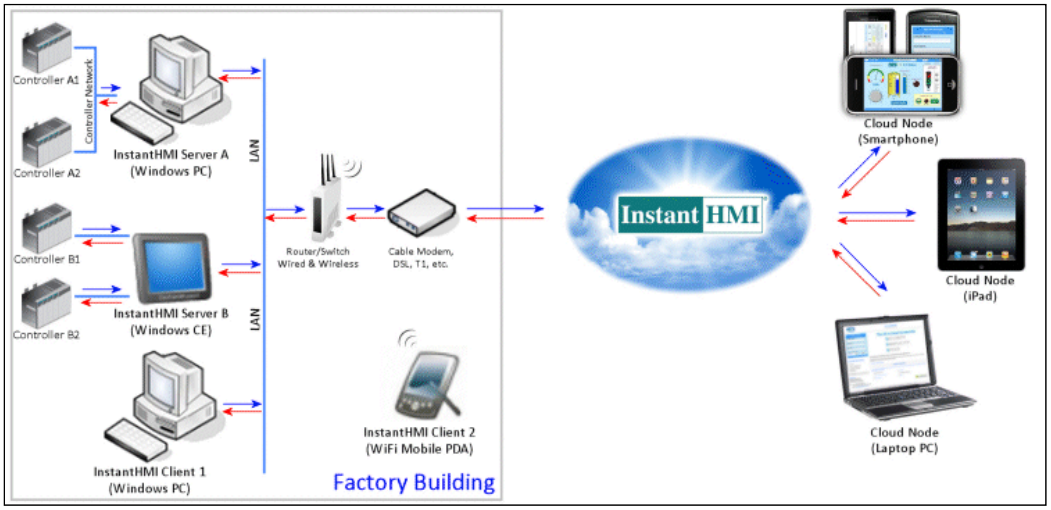


Figure 11-5: Multiple Servers, Multiple Client Nodes, and Multiple Cloud Nodes in Perfect Harmony

The following nodes are shown:
Two InstantHMI Server Nodes: Server A and Server B on the LAN.
Two Client Nodes: Wired Client 1 connected over LAN and Wi-Fi Client 2 connected via Wireless Router. Each client may access Server A, or Server B, or both Servers A and B.

There are multiple Cloud Nodes with their browsers (iPad, iPhone, Android, BlackBerry, and Laptop PC). Each Cloud Node may access only one server of choice (A or B) at a time (for security reasons); but the cloud node can easily switch from one server to another. Cloud Nodes can access any of the screens on the Server's HMI-project independent of the Server's own screen access. Each Cloud Node (if GTMH/Alarm service is enabled) may access the alarm page and ACK the selected alarms. Each Cloud Node (if GTMH/Control service is enabled) may enter data through appropriate screen objects. Discrete and/or analog values can be entered from the Cloud Node to alter the corresponding tag values in the selected Server.

11.4 TCP/IP Configuration Issues

11.4.1 TCP/IP Port Forwarding

InstantHMI Client can connect to InstantHMI Server over LAN or over Internet. For Internet connectivity you may use 'Port Forwarding' to get Client TCP/IP packets forwarded to the Server. InstantHMI has the IANA assigned port 2364. In InstantHMI Data Source definition, if you leave the port number unspecified (that is, 0) it will be defaulted to 2364, but any other port # can be used (see Run ➔ Options in LaunchPad or Project.ini file). To connect to multiple Servers over Internet use port forwarding of multiple ports to the corresponding servers.

In order to connect to a remote InstantHMI Server over the Internet and/or through a router, the router must be configured to send InstantHMI related traffic to the InstantHMI Server. By default an InstantHMI Server (with an IP address say, 192.168.1.1) will listen on TCP Port 2364 for incoming client connections. The router on the Server's network must be configured to pass traffic (using the Port Forwarding feature in the router) destined for TCP 2364 to the InstantHMI Server (in our example, 192.168.1.1).

If you have multiple InstantHMI Servers on a network, configure each InstantHMI Server to listen on a different specific port.* Then configure your router to forward traffic to the appropriate server. This can be done in the LaunchPad, Run ➔ Pause ➔ Options ➔ Server Port# = (as required). Alternatively, in your InstantHMI Project Folder, change the SHIP_SERVER_PORT value in the [IHMIRT] section in Project.ini:

```
[IHMIRT]
SHIP_SERVER_PORT=2364
```

* Check with your network administrator to find out available ports on your network and/or to properly configure Port-Forwarding for your network.

Well-known Ports = 1-1023 (Do not use these ports)
Registered Ports = 1024 through 49151 (InstantHMI has the IANA assigned port 2364)
Private / Dynamic Ports = 49152 through 65535 (These are non-reserved ports and should be safe to use)

11.4.2 TCP/IP Push Bit

Question: I have used InstantHMI Modbus TCP driver several times with Modicon Quantum controllers. However, my new Modbus controller (from another motion drive vendor) does not communicate with InstantHMI. What is wrong?

Answer: The TCP/IP Push Bit behavior in Windows can affect the communications in certain drivers (example: Modbus TCP). If you find that the communication behavior for your controller is not satisfactory, you may try the following procedure:

Caution:
If you are unfamiliar with Windows Registry editing, you must seek competent help before attempting to do this. Also, this editing of Windows Registry may affect the behavior of some other applications using the TCP/IP protocol stack.

a) Click **Start → Run** and type **regedit** into the Run Window
b) Navigate to **HKEY_LOCAL_MACHINE** by clicking the plus sign to the left of its name
c) Navigate to **SYSTEM**
d) Navigate to **CurrentControlSet**
e) Navigate to **Services**
f) Navigate to **AFD**
g) Click on the **Parameters** folder to select it
h) Click **Edit → New → DWORD Value**
i) Change the name (in the Right-Hand Pane) from New Value #1 to IgnorePushBitOnReceives
j) Double-Click **IgnorePushBitOnReceives** and change the value from **0** to **1**
K) Exit Regedit and Reboot your PC for the changes to take effect

11.4.3 TCP/IP Controller Node Selection in InstantHMI Runtime

Question: How do I select a specific controller device (Node) on a TCP/IP Network?

Answer: InstantHMI screen objects are associated with tags, which identify the specific memory location in a specific device (controller). Each device on a TCP/IP network has a unique IP address. InstantHMI allows the tags to refer to a specific device directly (as specified in the tag), or indirectly as defined by another Tag which serves as the device selector.

Example:
Our modbus controller network has two devices.
1. 'Mold Machine'
2. 'Robot Controller'

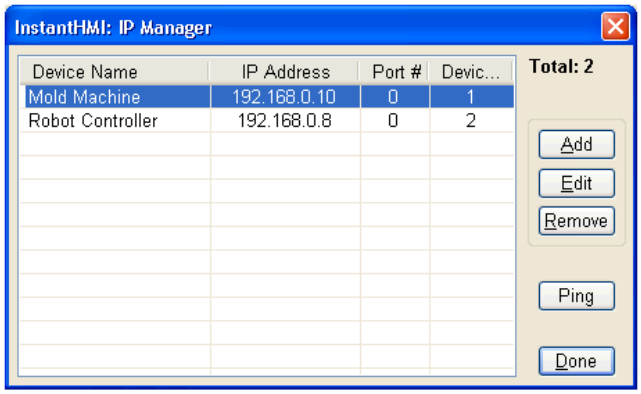


Figure 11-6: IP Manager

How Data Source identifies the Network Device

The Data Source for the tags has a default device name ('Robot Controller'). The Data Source also allows the default device selection to be over-ridden based on the value in the tag 'Mold/Robot Selector'. When 'Mold/Robot Selector' tag has the value 1, the Data Source uses device 1 (Mold Machine) for the data and when it has the value 2, the Data Source uses device 2 (Robot Controller) for the data. If the tag 'Mold/Robot Selector' has an undefined value for device selection, then the default device in the Data Source will be used.

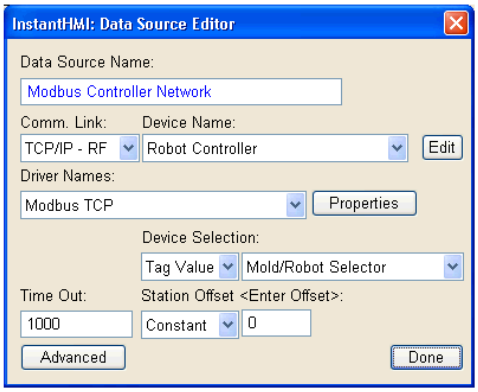


Figure 11-7: Data Source Editor

How Tag identifies the Network Device

Whenever a device name is specified in the Tag (example: Mold Machine), it will take precedence over the 'default device' (Robot Controller) in the Data Source. However, the device name for the tag may be selected to be 'Data Source Defined'. In this case the selection of the device is as discussed earlier.

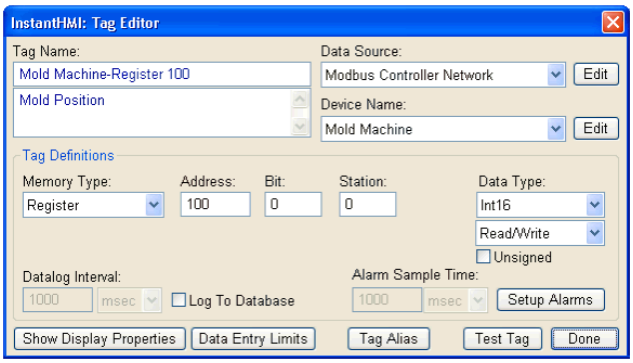


Figure 11-8: Tag Editor

Summary

InstantHMI supports simultaneously the following:
1. tags defined specifically for device 1 'Mold Machine' (2 tags shown),
2. tags defined specifically for device 2 'Robot Controller' (2 tags shown),

3. tags usable for both devices 'Mold/Robot' (2 tags shown) using the third tag 'Mold/Robot Selector' serving as the device selector in the Data Source definition.

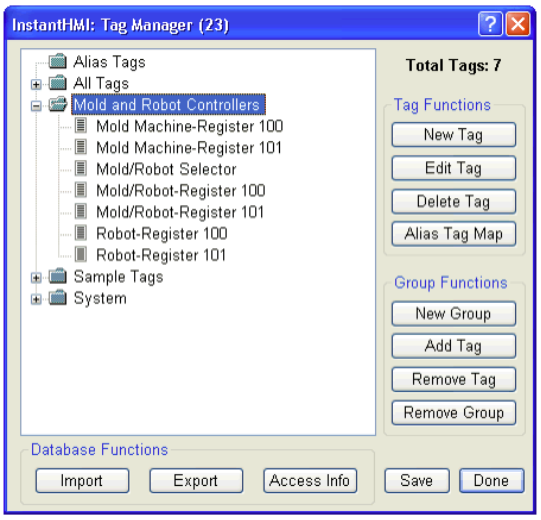


Figure 11-9: Tag Manager

11.5 TCP/IP Interface SHIP Protocol Implementation

The InstantHMI node (computer) with Controller(s) connected to it is termed a 'Server' node. Any other InstantHMI node which reads/writes data from/to the Server node is termed a 'Client' node.

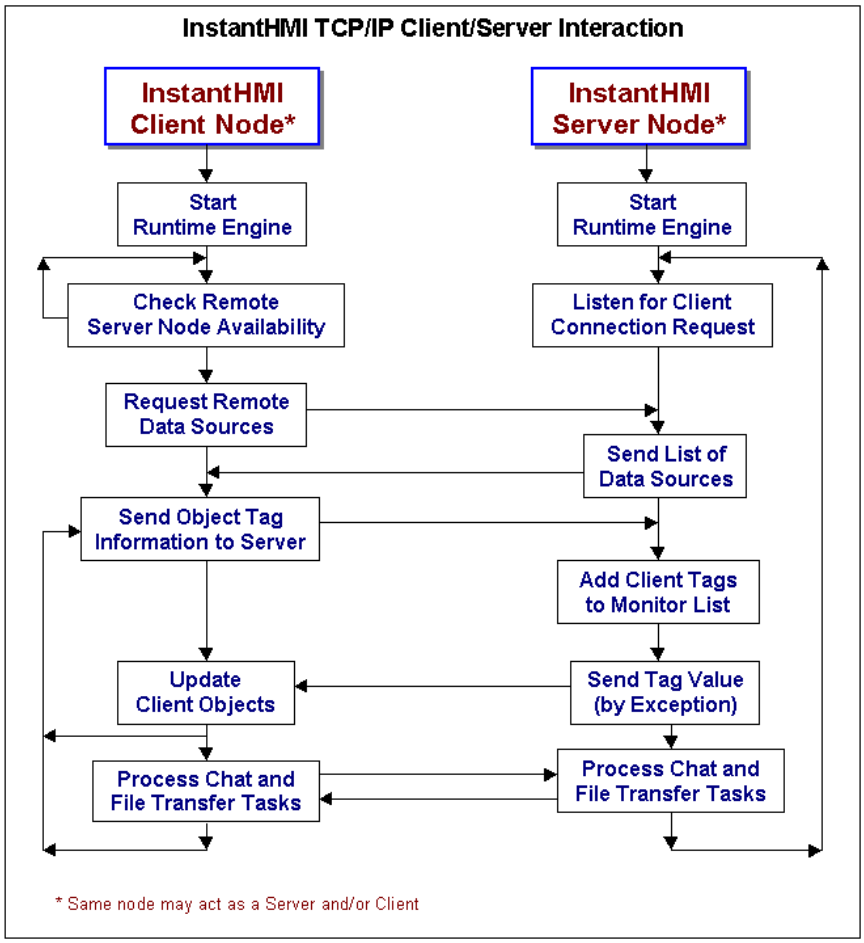

InstantHMI TCP/IP Client/Server Interaction
InstantHMI Client Node*
InstantHMI Server Node*
Start Runtime Engine
Start Runtime Engine
Check Remote Server Node Availability
Listen for Client Connection Request
Request Remote Data Sources
Send List of Data Sources
Send Object Tag Information to Server
Add Client Tags to Monitor List
Update Client Objects
Send Tag Value (by Exception)
Process Chat and File Transfer Tasks
Process Chat and File Transfer Tasks
* Same node may act as a Server and/or Client

Figure 11-10: TCP/IP Client/Server Runtime Interaction under SHIP Protocol

Note that a single node may perform both roles: a client accessing data through another node acting as a server, and a server providing data access to some other client node. Each tag in the tag database (for both Client and Server) will have a Data Source attached to it. For the data objects placed on a screen, you will be able to override the tag data source at screen creation time if you so desire. This may be necessary for projects where you want to view the same parameter from multiple controllers, where the only difference may be the IP address of the server.

Note1: An IP address is like a Postal Address for the Internet. It lets any computer know how to reach any other computer. To find your computer's IP Address in Windows, click Start → Run → and type "cmd", and in the command window type "ipconfig". You may see more than one network adapter. (If dialing into the Internet get the IP address from the PPP adapter).

Note2: If you are unsure what your IP address is, please consult your company's Network Administrator. Software Horizons does not provide assistance to configure or troubleshoot your network or Internet connection; we provide Technical Support only for matters relating to the InstantHMI Software Package and its TCP/IP functionality.

11.5.1 TCP/IP InstantHMI Server Node

The tags and display objects for the server node are exactly what we have discussed in earlier sections (Sections 4.5, 4.11). After the runtime engine is initialized, if it has a server task (that is, it provides read/write access to controller data from other client nodes), it will begin listening for connections from Runtime Engine clients (using Server TCP Port 2364, by default). When a client tries to connect with the server there may be some type of authentication (involving user name and password passed between them) to ensure that the connection is authorized. If the connection is accepted the client will ask the server for its available Data Sources; the server will send a list of available data sources and the client will match its remote data source name with an appropriate data source name from the server. The client will then send a list of active tags (referencing the server as the remote IHMI Node) which the server will then add to its list of monitor tags. When the server detects that the data has changed, it will send the changed data to the requesting client.

SHIP Client Users Database (IHMI-ServerDB.idb)

This database identifies SHIP Clients (Server Users) and allows InstantHMI SHIP Clients to connect with InstantHMI SHIP server. Create this database in the LaunchPad using the Client User Manager (LaunchPad →Design → Data Sources → Select 'Ship Client Users' → Client User Manager).

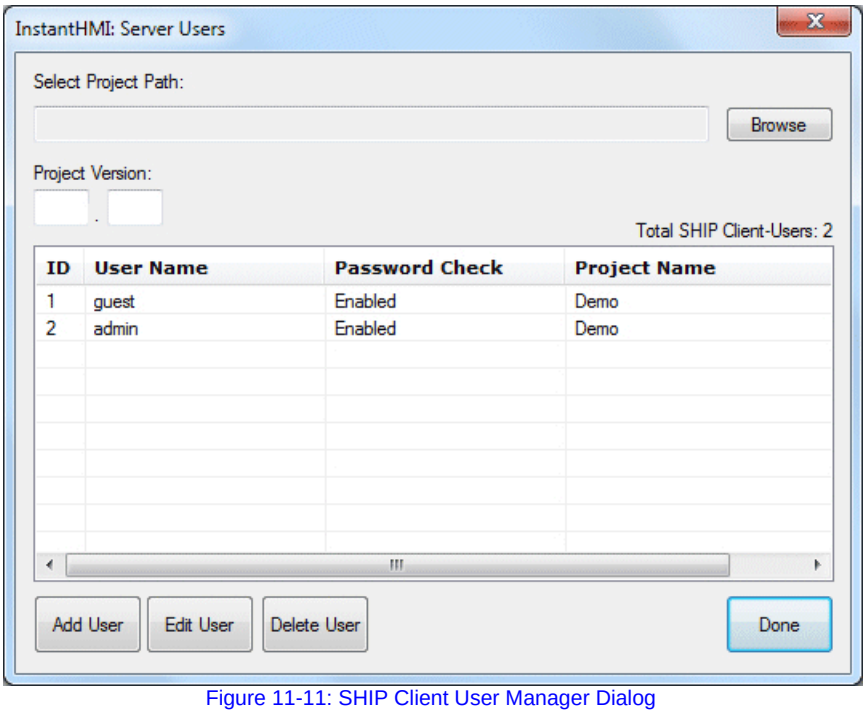


Figure 11-11: SHIP Client User Manager Dialog

Click on 'Add User' to add server users (e.g. Operator). Enter 'User Name', Password and click 'Enable Password Check' for secured connection with your HMI Server.

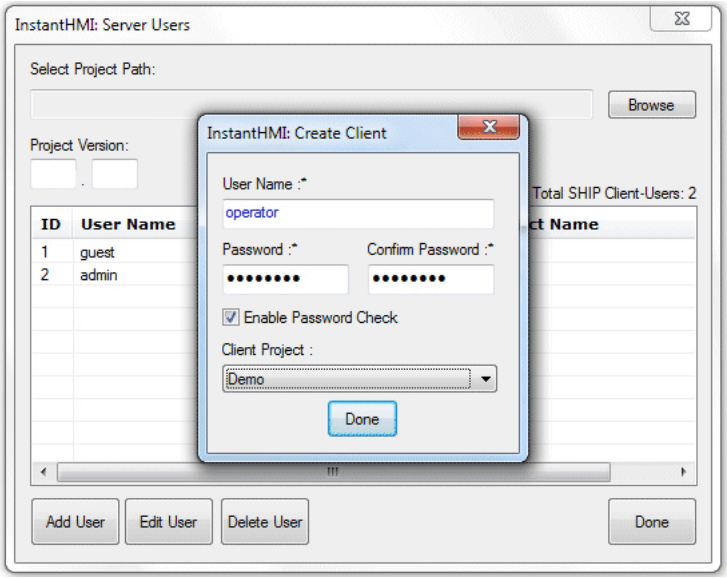


Figure 11-12: Add Server User (Client) to the Database 'IHMI-ServerDB.idb'

11.5.2 TCP/IP InstantHMI Client Node

The tags and display objects for the client node are similar to what we have discussed in earlier sections (Sections 4.5, 4.11). However, one big difference is that the remote Data Source is attached to a remote server. The server is identified by selecting the Comm Link as an IHMI Node with Device/Node Name to match that of the server (that is, its associated IP address).

After the runtime engine is initialized, if it has a Client task (that is, it requires read/write access to controller data from other server nodes), it will try to connect with the server(s). The client will then send a list of active tags (referencing the server as the remote IHMI Node) which the server will then add to its list of monitor tags. When the server detects that the client data has changed, it will send the changed data to the requesting client. The client will receive the data from the server and update the screen and other data objects as appropriate.

Register InstantHMI (SHIP) Server on-line with GoToMyHMI.com site

Registration helps the InstantHMI Client to initiate a connection with the InstantHMI Server even if its IP address is not fixed (That is, Dynamic IP address) or its IP address is not known to the Client. Registration happens automatically when the InstantHMI Server Runtime Options are set as follows:

1. Enable 'Server Status'
2. Specify 'Server Port #' (or use 2364, Software Horizons registered IANA port)
3. Enable 'Server Registration'
4. Enter 'Server Company' & 'Server Name'.
   (These parameters are used in the Client 'Data Source' setup.)

When the InstantHMI (SHIP-Server) Runtime is initialized, it accesses the GoToMyHMI.com site and runs a Script to record Server IP address, Server Company and Server Name. When the InstantHMI SHIP-Client Runtime wishes to connect to its SHIP-Server (identified by Server Company and Server Name in Client's Data Source definition, where the unknown Server IP address is left blank (0.0.0.0)), its Runtime during initialization accesses the GoToMyHMI.com site and runs a Script, which accesses the Server IP address (after proper authentication). Once the Server IP address is known, TCP/IP connection is made and the SHIP protocol does the rest between the InstantHMI Client-Server setup.

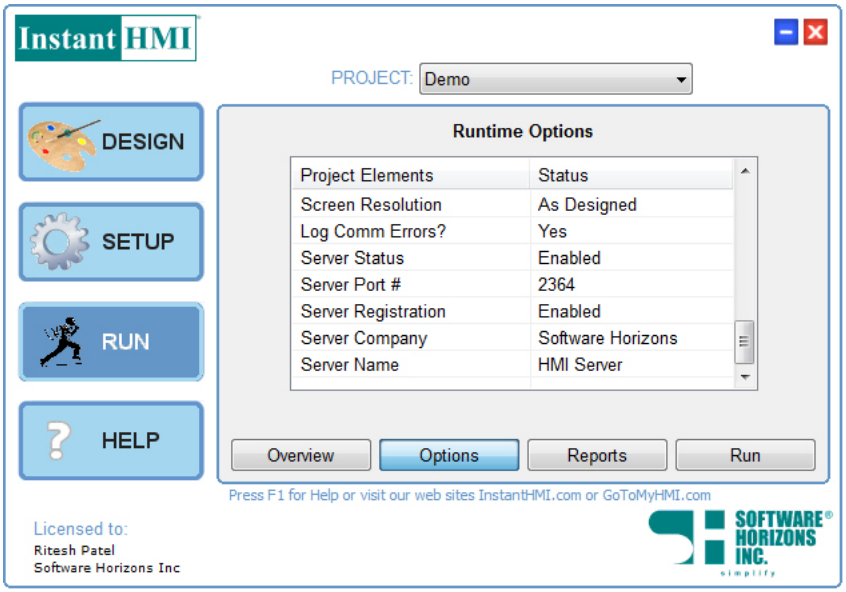


Figure 11-13: SHIP Server Registration Setup in LaunchPad

11.5.3 TCP/IP Client Objects in Screen Designer

When you create any data object (in the InstantHMI Screen Designer) you will have the option of addressing a local (client's own) data source or a remote (server) data source. The data source identifies where the runtime data will come from. Each data source will have a name (you provide) to identify it. In addition, you will select the communication link (Direct Serial, Infrared, TCP/IP to controller, or TCP/IP to IHMI Node); in the case of a local (client's own) data source you will also identify the communication driver. The remote data item for the client will come from a Runtime Engine server running on a TCP/IP network such as the Internet or LAN.

If the communication method is TCP/IP then you will select or identify a Device by a Device/Node Name that links to the IP address and Port # of the controller or InstantHMI device (IHMI Node) that originates the data. For a remote data item on the client screen, the communication link between the client InstantHMI node and the raw data is the TCP/IP link to the remote InstantHMI node (server), to which the data source is linked.

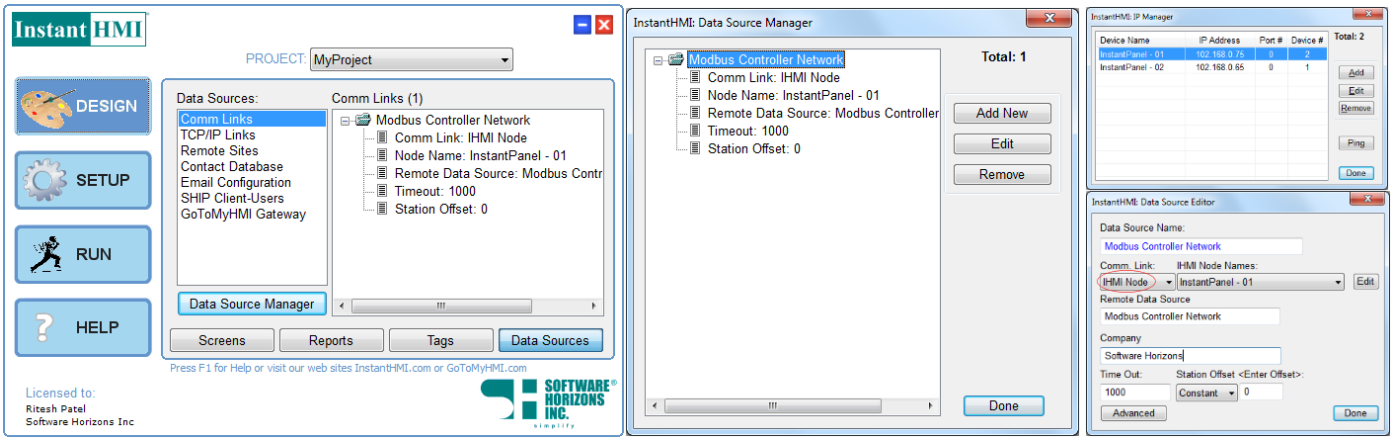


Figure 11-14: Data Source Manager and Editor (PC)

We shall now illustrate the creation of a remote (server) data source. In Screen Designer click on Tag Data → Data Sources to display the Data Source Manager dialog. Click on Add New button to display the Data Source Editor dialog. Here you can identify the remote InstantHMI (server) node as follows. Select the Comm Link 'IHMI Node'. Click on Edit button to display the IP Manager dialog. Click on the Add button and enter the server node 'Device Name' (WinME, in our illustration) and its IP address (192.168.0.7, in our illustration). Click Done to return to the Data Source Editor with the just defined (WinME) server 'IHMI Node Name'. Since the remote server may have associated with it

more than one Data Source, enter the specific Remote Data Source Name (Mitsubishi, in our illustration). If Remote Data Source Name is not known leave it blank. If the specific remote data source is unknown at project design time then the InstantHMI runtime engine will request it at runtime. Note that the client objects will reference the remote (server) data source name.

11.5.4 TCP/IP Device Names in Data Source Setup

InstantHMI allows access to controllers over an Ethernet LAN using wireless RF connectivity (using Modbus TCP or other protocols involving TCP/IP which require IP addresses for the PLC or InstantHMI runtime nodes). As discussed above, InstantHMI makes the job of specifying IP addresses more convenient by allowing you to associate 'Device/Node Names' to IP addresses. Only the device/node names will be used in Tags associated with that controller/IHMI Node. Hence, if a network is reconfigured, updating the tag database is easy. All you need to do is use the **IP Manager** to reenter the changed IP address for the device/node name. Use the IP Manager to manage the list of device names and their associated IP addresses.

The Data Source Manager discussed above applies to non-PC platforms (PDAs and Windows CE) as well. On a PDA based InstantHMI, you may access the IP manager screen through the Data Source editor or through the InstantHMI Menu Screen (Tag Variables → IP Manager). The screens for Data Source IP Manager are shown below.

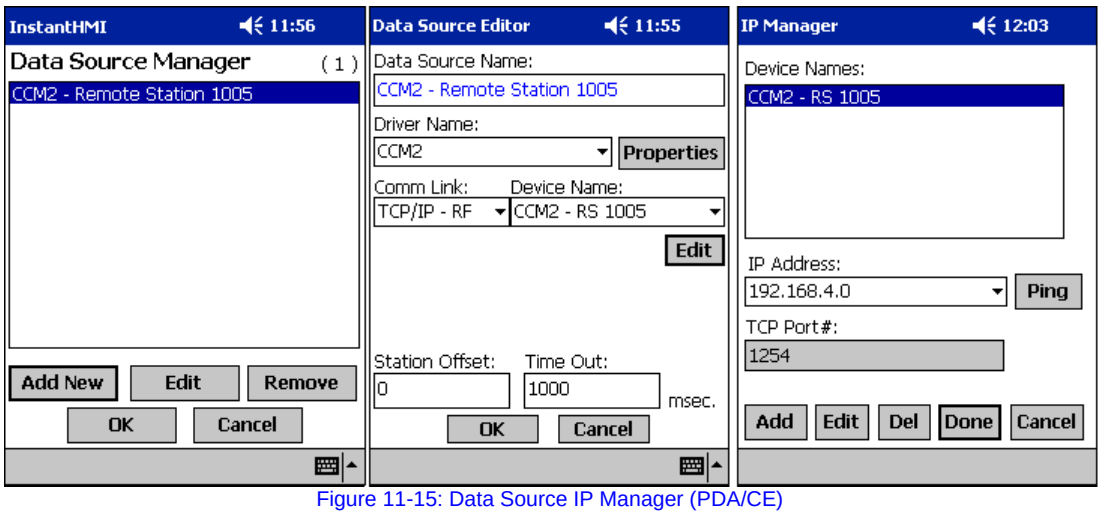


Figure 11-15: Data Source IP Manager (PDA/CE)

(Note: Some features in this paragraph may not be available in the current implementation)

The IP Manager is useful when the InstantHMI node (computer with InstantHMI Runtime Engine running) does not have a static IP address (due to dial-up Internet access or a dynamic IP environment). InstantHMI allows IP-names to be used in your InstantHMI tags (for use in Widget and Data Objects). Later, at run time it is possible to assign actual IP addresses to these IP-names. If the IP address changed, you simply have to use the IP Manager and change the IP address that is assigned to a IP-name, and all of your objects now point to the correct IP address. The IP Address Manager simplifies setup in a dynamic IP environment. It is also possible for an InstantHMI node that is going to be sharing data (an InstantHMI Server) to inform potential InstantHMI client nodes of its IP address by email. Then any client node can retrieve the InstantHMI server node's IP address from its email and connect to the server. It is simpler (and we also recommend it) for any InstantHMI server using the TCP/IP connectivity option to use a static IP address.

Note: Due to bad Internet connections, server latency and other factors you may experience difficulty getting the client object monitor sample time that you request. It is best to try different sample times and see what works the best in your case.

11.5.5 TCP/IP Used in Project Deployment

InstantHMI projects (screens and other elements) may be deployed on any of the supported runtime platforms (Windows PC, Windows CE, and PDA) using TCP/IP or Serial link. **Note**: Microsoft's Activesync is used to deploy to CE/PDA platforms over serial link (Section 2.4.4). The LaunchPad Designer allows you to select the platform (which implies the OS and screen resolution). For TCP/IP project deployment InstantHMI's built-in inter-node communication facility (SHIP Protocol) is used over wired LAN link or wireless RF link. InstantHMI TCP/IP link incorporates a **File Transfer** capability at each run-time node as well as the LaunchPad development system. This facility is used along with SHIP to deploy project elements on target platforms as well as retrieve reports and data from runtime engine nodes. The four Steps involved in Project Deployment using TCP/IP are described below. (TCP/IP deployment log records the TCP/IP deployment errors).

Step 1: Select target Platform and Project Elements to Deploy
If you click on LaunchPad → Setup command button you will see the list of all Projects (and the Platform they are designed for). Confirm that the Project you wish to deploy is the one selected. If not, select it from the list. (Note: If you change the Project selection using the pull-down list, the LaunchPad will return you to the Design mode. In this case, click on Setup button and proceed to deploy.) Click on Deploy button and you will see the Project Elements dialog listing available elements. If the displayed target platform (for which the original project was designed) is not what you want, then change it using the Runtime Target platform pull-down list. You may now select the project elements such as Project Screens, Tag Database, etc. to deploy.

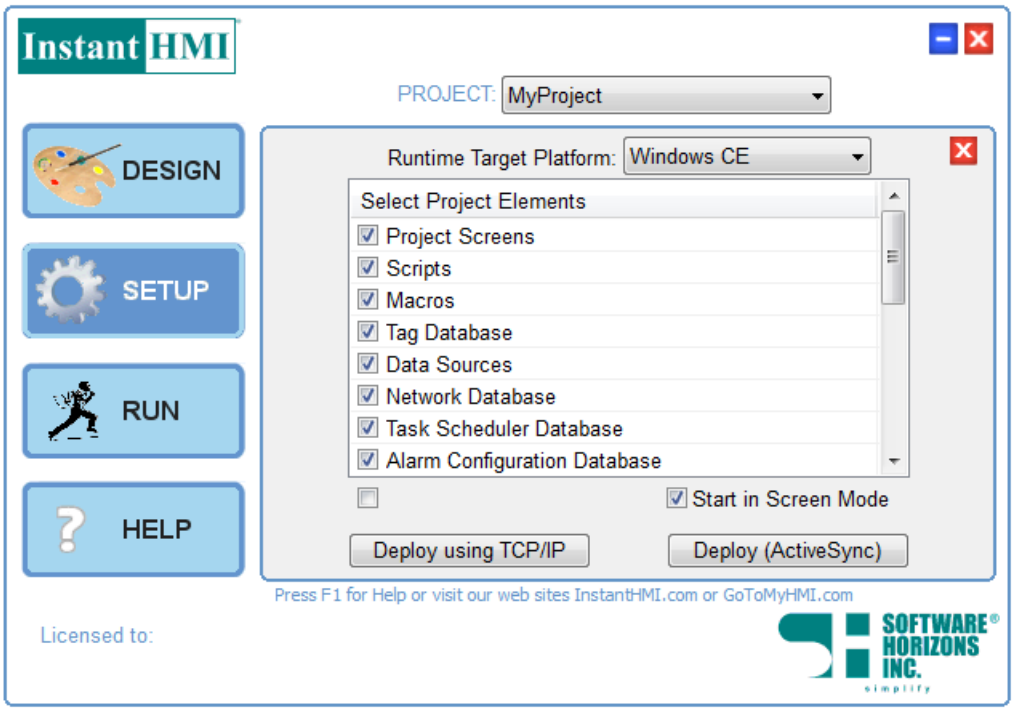


Figure 11-16: Step1: Launch Pad - Deploy Project to Windows CE Platform (using LAN/Internet)

Click on 'Deploy Using TCP/IP' button to transfer the selected project elements to the target platform.

Step 2: Select Target Node to Deploy Project
You will see the IP manager dialog showing available nodes for project deployment. If the desired node is not shown then click on Add button and enter the required information to identify the target Node. Otherwise, select the Target Node from the list (For example, InstantPanel-01). You may 'Ping' to confirm that the target node is reachable for deployment. Click on Done button when ready for deployment.

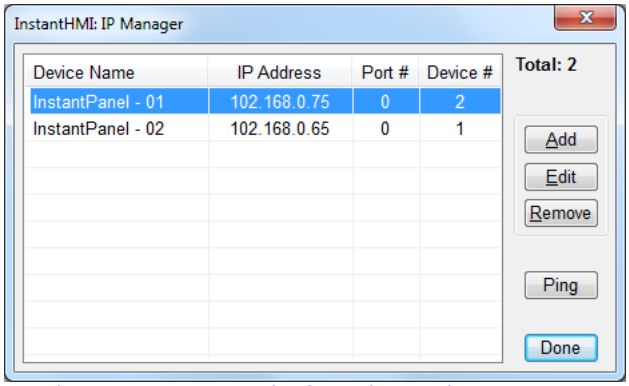


Figure 11-17: target Nodes for Project Deployment

The target platform must have InstantHMI Runtime Engine running for successful project deployment. Otherwise, LaunchPad will display an appropriate message that the Target is not ready for receiving deployed project.

Step 3: Backup Previous Project

LaunchPad will show the following message box. It is always a good practice to 'Backup Previous Version of Project' before Deploying Project. Click Yes to Backup InstantHMI Project; otherwise, click No.

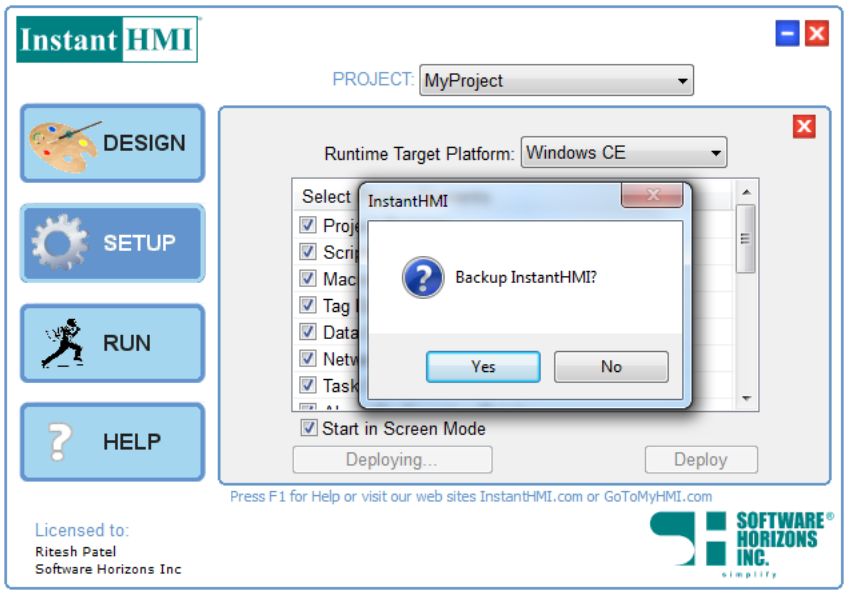


Figure 11-18: Backup Previous Project Message

Step 4: Project Deployment Completion Status

You will see a (modeless) 'Progress dialog'. Once deployment is complete, you will be informed of any 'Project Elements' that could not be deployed because they are not present in the current project folder (Example: IHMI-AlarmConfigDB.idb). If this is satisfactory, then deployment is complete. Otherwise, repeat the Project Deployment steps again with correct choice of Project Elements.

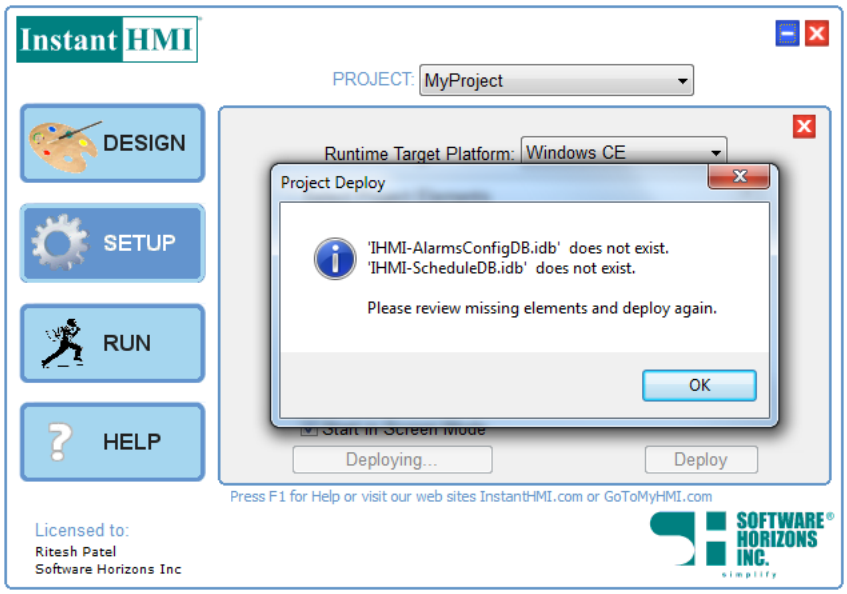


Figure 11-19: Project Deployment Complete (Missing Elements Shown)

11.5.6 TCP/IP Chat Utility

Chat can be useful in many instances. For example, suppose there is a supervisory InstantHMI node responsible for keeping track of efficiency, production rates and other information about the process being monitored. The InstantHMI Chat feature allows for communication to the plant/factory floor to discuss with Operators about an Alarm, low production or other problem that may be occurring. These nodes may be located 'across the room' only a few feet away on your company LAN, or miles away on your company WAN, or 'across the world' over the Internet.

When the TCP/IP connectivity option is installed, you may use the InstantHMI **Chat** utility. To access the Chat feature, in the Runtime Menu click on Comm Links → Chat Utility; the chat utility dialog will appear. The InstantHMI Chat feature also allows for dissemination of information to multiple InstantHMI nodes using the 'All Nodes' selection. This allows for text messages to be exchanged between two or more InstantHMI nodes as shown in the example Chat in Figure 11-20.

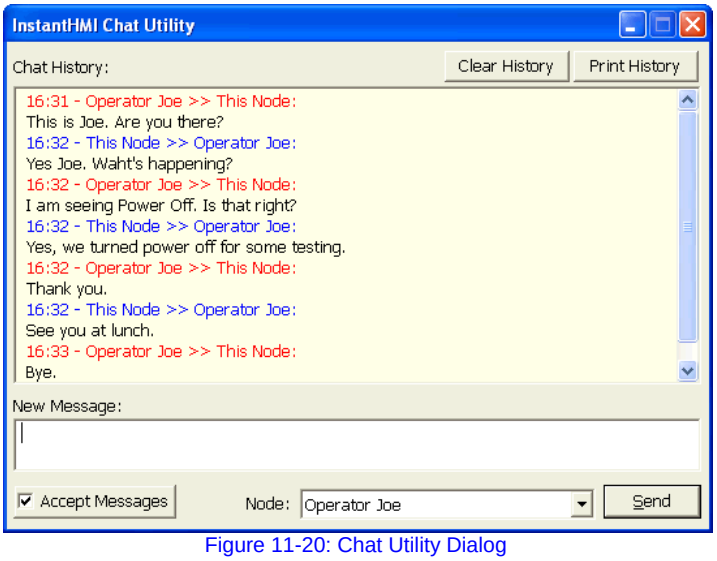

InstantHMI Chat Utility
Chat History:
Clear History
Print History
16:31 - Operator Joe >> This Node:
This is Joe. Are you there?
16:32 - This Node >> Operator Joe:
Yes Joe. Waht's happening?
16:32 - Operator Joe >> This Node:
I am seeing Power Off. Is that right?
16:32 - This Node >> Operator Joe:
Yes, we turned power off for some testing.
16:32 - Operator Joe >> This Node:
Thank you.
16:32 - This Node >> Operator Joe:
See you at lunch.
16:33 - Operator Joe >> This Node:
Bye.
New Message:
Accept Messages
Node: Operator Joe
Send

Figure 11-20: Chat Utility Dialog

When the Chat dialog appears, the Node pull-down list shows InstantHMI node names available to chat with. This requires that a TCP/IP connection has been made with each of the available nodes. Any node may 'Accept Messages' to participate in the Chat function or refuse such messages. In the broadcast chat mode (‘All Nodes’), each of the connected InstantHMI nodes will see your sent

message. In the private (non-broadcast) chat mode only the selected node will receive the private chat messages sent.

To start a private chat, select one of the (Connected InstantHMI) Nodes and type the text in the 'New Message' edit field. Type Enter key or click Send. The message will be sent to the node (user) you want to have a private chat with. If he accepts, your private chat will begin. When you click the Send button, the message will be displayed in a scrollable 'Chat History' panel on all of the chat screens involved in the chat including the sender of the message. The message displayed will be preceded by a time stamp and the node name and/or user name the message was sent from. To go back to the broadcast chat mode select 'All Nodes' from the Node pull-down list.

11.6 TCP/IP Interface Example

For illustrative purposes assume we have two InstantHMI nodes (Node 1 and Node 2) connected over an Ethernet LAN. Node 1 has a Direct Logic DL205 PLC connected to its serial port. Assume you have created and tested an HMI project capable of monitoring and modifying memory locations (registers and I/O) in the PLC. Now you wish to mimic the functionality of Node 1 in Node 2 so that you may monitor and control the process (PLC parameters) from Node 2 as easily as you could from Node 1. The situation is as follows:

- Node 1 has a server task (provides read/write access to its controller data from Node 2)
- Node 2 has a Client task (requires read/write access to Node 1 controller data)

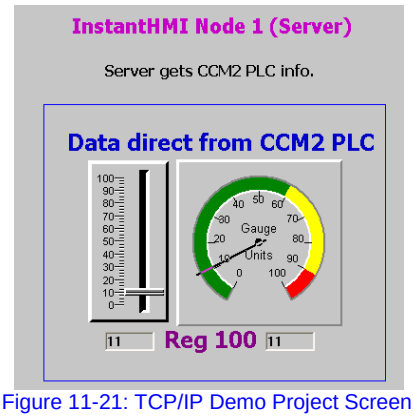


Figure 11-21: TCP/IP Demo Project Screen

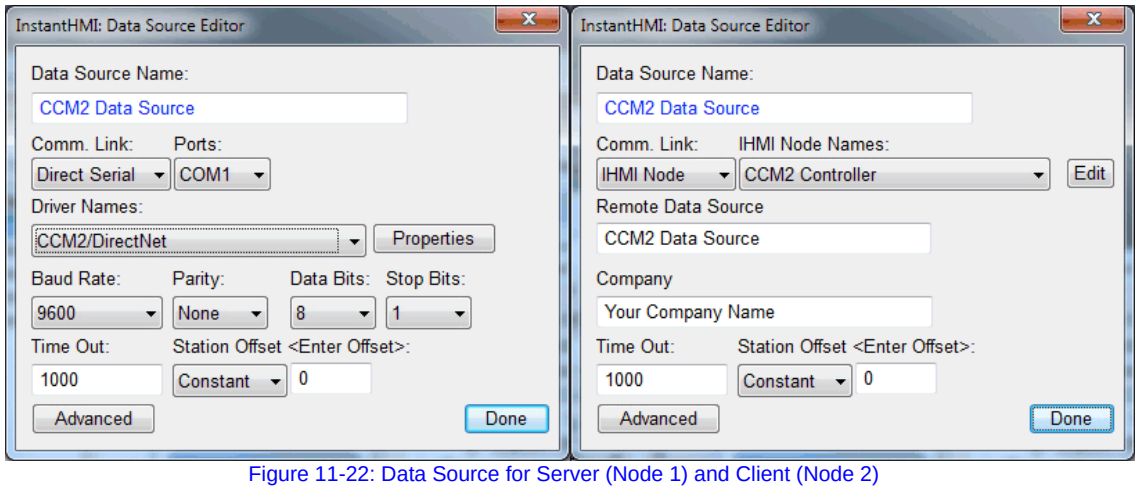


Figure 11-22: Data Source for Server (Node 1) and Client (Node 2)

To accomplish the above objective, it is sufficient to do the following:

Deploy a copy of the InstantHMI project from Node 1 on Node 2. This will include the screens (Figure 11-21 for example) and the Tag Database.

Assume Node 1 Data Source 'CCM2 Data Source' defines the serial link parameters to access and control the DL205 PLC serially (Figure 11-22). Since all screen objects refer to the 'CCM2 Data Source', edit this Data Source for Node 2 making Comm Link = IHMI Node, and Remote Data Source = 'CCM2 Data Source'. It is convenient to use the same name 'CCM2 Data Source' for the client (local) Data Source Name as well. This will allow you to use (without any change) all screen objects and screens copied from Node 1 and deployed on Node 2.

Now run InstantHMI on Node 2.

If Node 1 is running, it will begin listening for connection request from Node 2 (and other Runtime Engine clients. When Node 2 client tries to connect with the server Node 1, there may be some type of authentication (involving user name and password passed) to ensure that Node 1 can accept connection request from Node 2. Once the connection is accepted, Node 2 will ask the server Node 1 for its available Data Sources. Node 1 will send a list of available data sources (which we know to include 'CCM2 Data Source') and Node 2 will match its remote data source name with the name 'CCM2 Data Source' from Node 1. Node 1 will now send a list of active tags (referencing the server Node 1 as the remote IHMI Node) which Node 1 will then add to its list of monitor tags. When the server Node 1 detects that the data has changed, it will send the changed data to the requesting client Node 2. The client Node 2 will receive the data from the server Node 1 and update the screen data objects.

On Server Node 1, try entering data into the input field (Fader) and see if it is monitored back on the Gauge on the Server Node 1 as well as Client Node 2. On client Node 2, try entering data into the input field (Fader) and see if it is monitored back on the Gauge on the Client Node 2 as well as Server Node 1. This successfully tests the ease with which you can duplicate and deploy projects on multiple Client Nodes. All it took was a simple re-definition of data source on the client. In our simple TCP/IP Demo example there was a simple screen and tag database which were copied onto the client. Of course, you may have totally different screens and tags on the client node if you like.

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12 OPC Interface

12.1 Introduction

OPC (OLE for Process Control) is a standard OLE/COM interface communication protocol that allows OPC Servers and OPC Clients to exchange information relevant to field devices, and process controllers. InstantHMI implements OPC Client Data Access to OPC Servers.

For illustrative purposes, we show below two InstantHMI configurations for OPC Data Access. Many other configurations are, of course, possible.

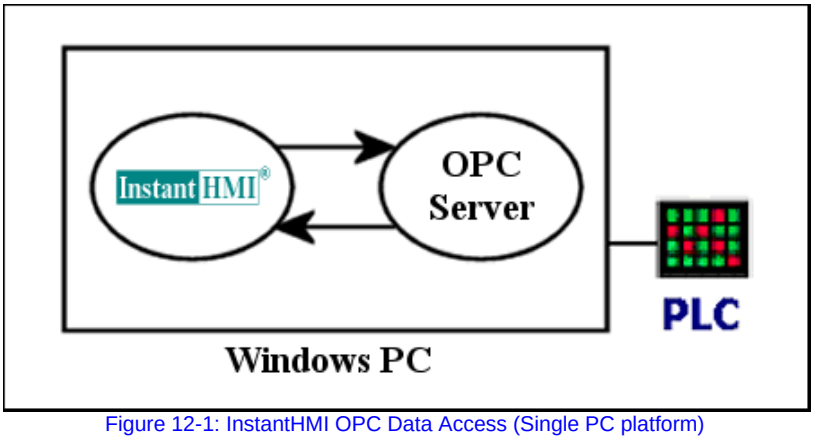


Figure 12-1: InstantHMI OPC Data Access (Single PC platform)

Figure 12-1 shows InstantHMI software (OPC Data Access client) connected to an OPC Server connected to a PLC. The InstantHMI client can view and modify data from the PLC (connected to the server). This allows you the flexibility of connecting with multiple servers.

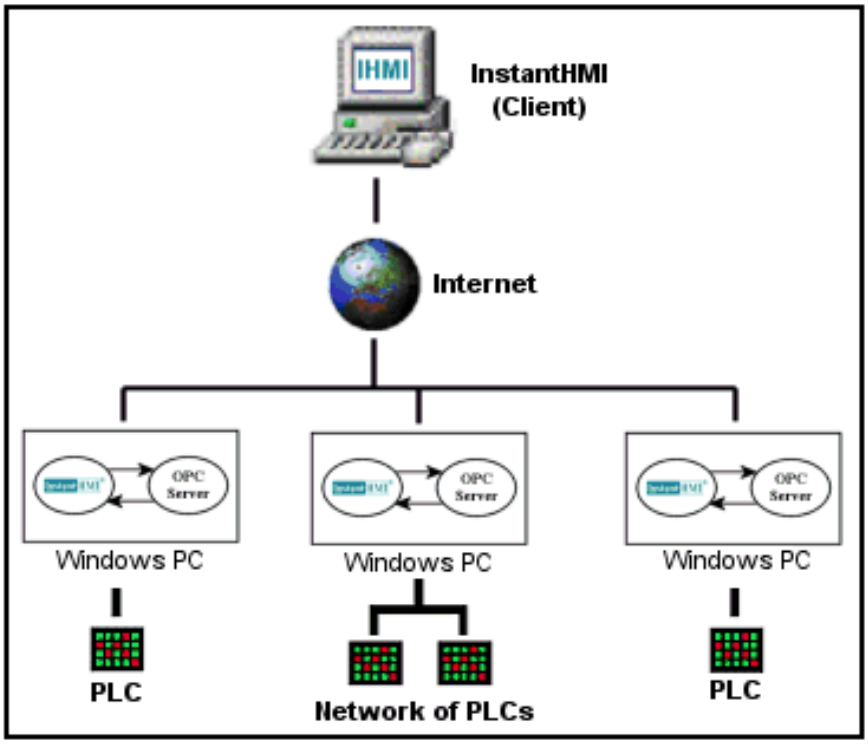


Figure 12-2: InstantHMI OPC Data Access over LAN

Figure 12-2 shows a more complex configuration. We have one InstantHMI node acting as a supervisory computer ('Super OPC Client Node') that is collecting data from several (server) InstantHMI nodes. Each of the server InstantHMI nodes is an OPC client connected to an OPC

server connected to a PLC or network of PLCs. This allows the Super Node to read and/or write data to the attached PLCs of the remote nodes.

Using the above example as a guide you can configure InstantHMI to exchange information among InstantHMI nodes. This can be used, for example, if you need to transfer data from one PLC to another that are at different sites, or to transfer data from one type of PLC (model 'A') to another (model 'B') at a remote location.

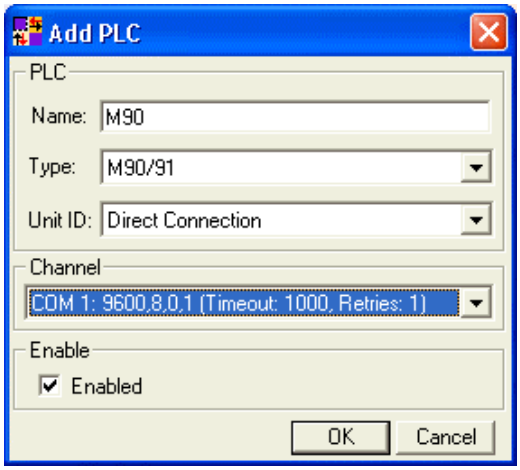
12.2 OPC Client Objects in Screen Designer

InstantHMI OPC Client reads/writes data from/to the OPC Server. Each tag in the tag database will have a Data Source attached to it.

The tags and display objects for the OPC client are similar to what we have discussed in earlier sections (Sections 4.6, 4.11). However, one big difference is that the Data Source is an OPC server. The server is identified by selecting the Comm Link as an OPC Server with OPC Server Name to match that of the relevant OPC server. (You must install and register the OPC Server(s) relevant to your application so that their registered OPC Server names are available in the PC's list of OPC servers for the Data Source identification in InstantHMI.)

Example (Unitronics PLC 'UniOPC' OPC Server)

- Install UniOPC Server (from Unitronics)
- UniOPC Server ➔ Add Channel (connection to device - M90 PLC)
- UniOPC Server ➔ Add PLC



- UniOPC Server ➔ Register
- UniOPC Server ➔ Run

Now you are ready to get data from/to Uni OPC Server. Create IHMI Data Source 'Unitronics OPC Server'.

Figure 12-3: OPC Server Setup Example

When you create any data object (in the InstantHMI Screen Designer) you will have the option of addressing a local (client's own) data source or a remote (server) data source.

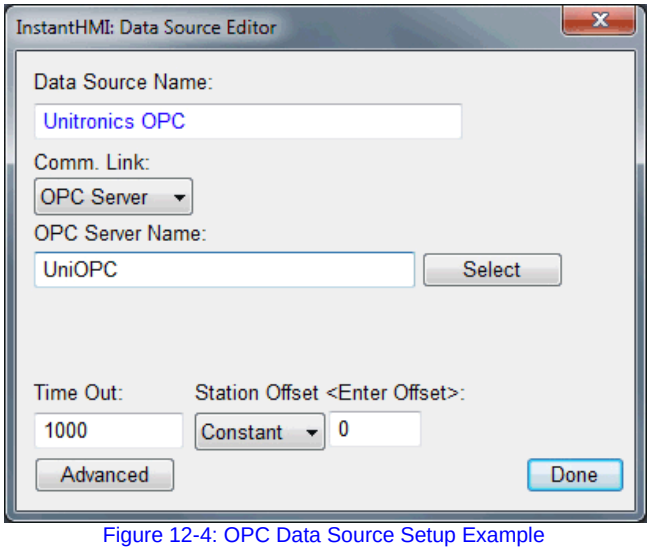


Figure 12-4: OPC Data Source Setup Example

The data source identifies where the runtime data will come from. Each data source will have a name (you provide) to identify it. In addition, you will select the communication link (OPC Server). The remote data item for the OPC client will come from an OPC server. Create OPC Data Source as shown. The OPC tags in Tag Manager will correspond to 'OPC items'. (For the UniOPC server the tag name has the form <PLC Name>.<Item Prefix><Address>; for example, the tag name **M90.MI1** identifies the **M**emory **I**nteger **1** in PLC **M90**.)

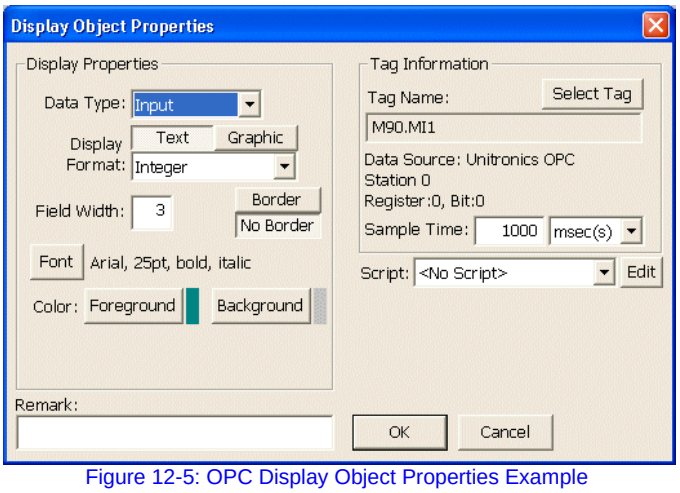


Figure 12-5: OPC Display Object Properties Example

12.3 OPC over DCOM via TCP/IP

This section describes how to configure an OPC Server and an OPC Client for communication over a network using DCOM. This document applies to Windows XP Service Pack 2, other Operating System Versions are not covered. This document assumes you have two computers, which will be referred to as **Server PC** and **Client PC**. The Server PC denotes the PC that will be actively running the OPC Server. The Client PC refers to the PC that will connect to the Server PC to get OPC data over DCOM. Before proceeding install an OPC Server on your Server PC and Client PC (See Example in Section 12.2).

12.3.1 Configure DCOM on Server PC and Client PCs

The steps in this section should be performed on both the **Server PC** and **Client PC**.

In Windows, click on Start → Run, type **dcomcnfg** and then click OK.

Step A. Under Component Services, click Computers.
Step B. Right-Click My Computer in the right-pane and choose **Properties**.

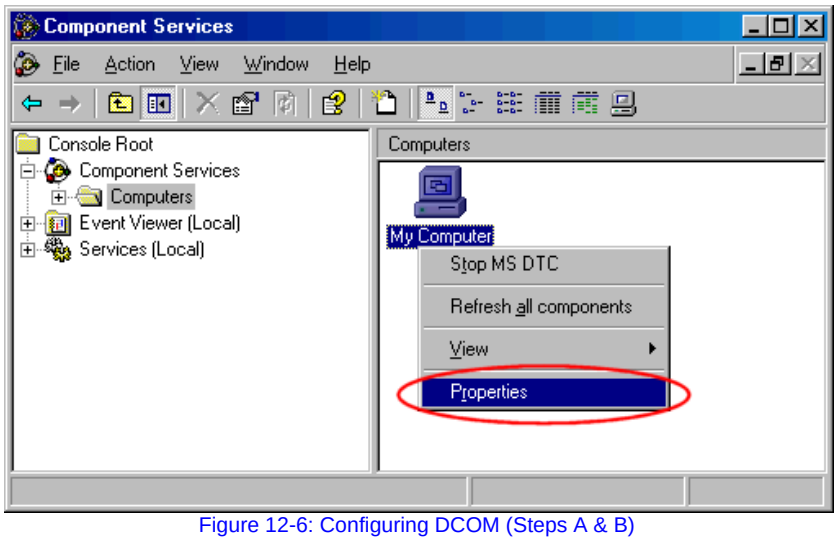


Figure 12-6: Configuring DCOM (Steps A & B)

Step C. Click the **Default Properties** Tab. Ensure 'Enable Distributed COM on this Computer' is Checked. The 'Default Authentication Level' should be set to 'Connect'. 'Default Impersonation Level' should be set to 'Identify'.

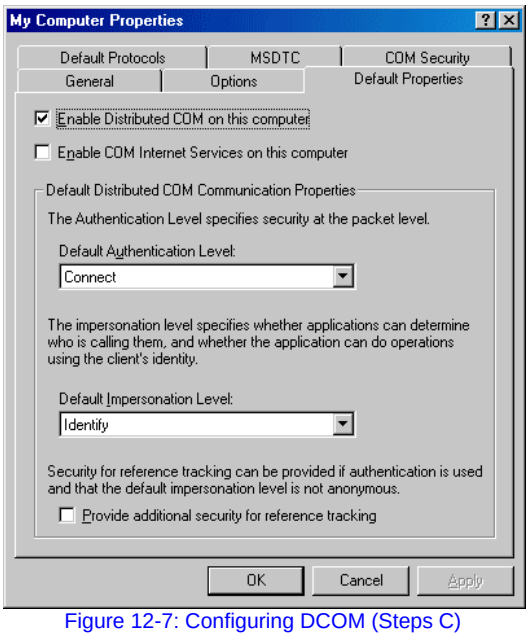

My Computer Properties
Default Protocols
MSDTC
COM Security
General
Options
Default Properties
Enable Distributed COM on this computer
Enable COM Internet Services on this computer
Default Distributed COM Communication Properties
The Authentication Level specifies security at the packet level.
Default Authentication Level:
Connect
The impersonation level specifies whether applications can determine who is calling them, and whether the application can do operations using the client's identity.
Default Impersonation Level:
Identify
Security for reference tracking can be provided if authentication is used and that the default impersonation level is not anonymous.
Provide additional security for reference tracking
OK
Cancel
Apply

Figure 12-7: Configuring DCOM (Steps C)

Step D. Click the **Default Protocols** Tab. If more than one protocol exists, ensure 'Connection-oriented TCP/IP' is at the 'TOP' of the list. Other protocols may be used but are beyond the scope of this document.

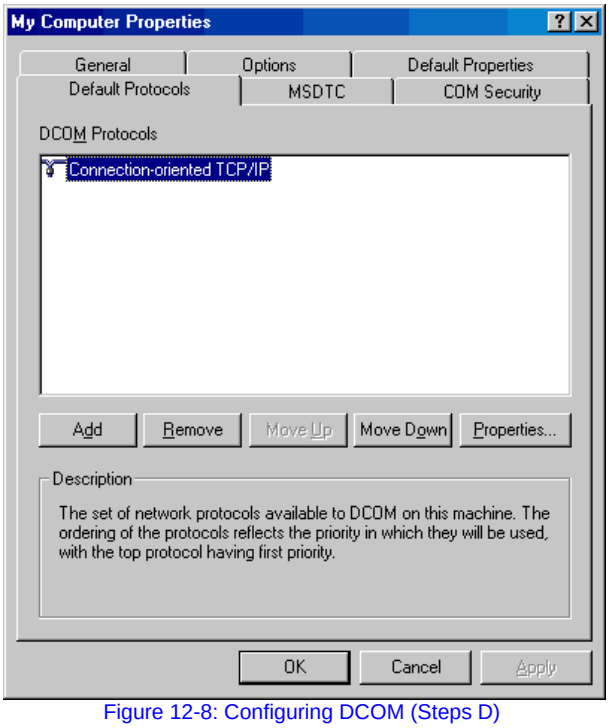


Figure 12-8: Configuring DCOM (Steps D)

Step E. Click the **COM Security** Tab. On this dialog there are security settings for 'Access Permissions' (Limits and Defaults) and 'Launch and Activation Permissions' (Limits and Defaults).

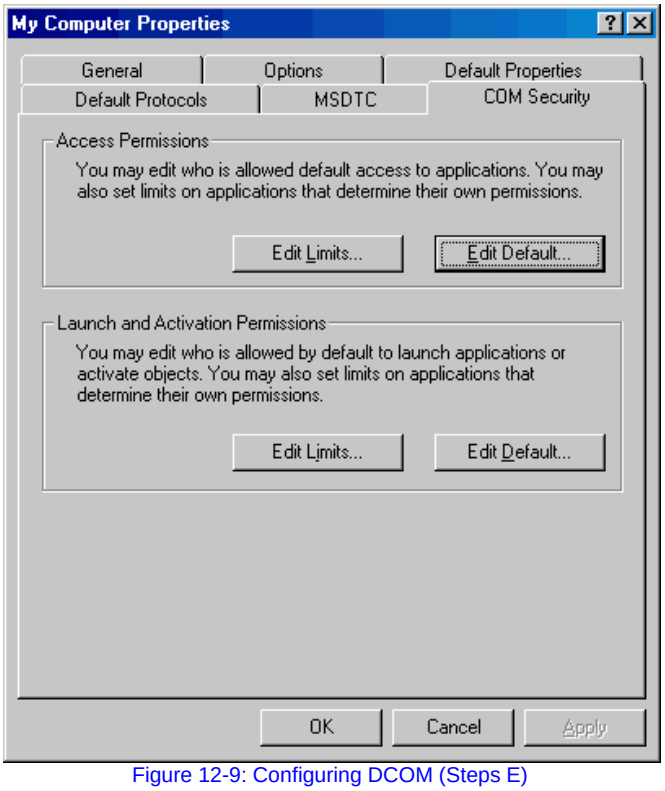

My Computer Properties
General
Options
Default Properties
Default Protocols
MSDTC
COM Security
Access Permissions
You may edit who is allowed default access to applications. You may also set limits on applications that determine their own permissions.
Edit Limits...
Edit Default...
Launch and Activation Permissions
You may edit who is allowed by default to launch applications or activate objects. You may also set limits on applications that determine their own permissions.
Edit Limits...
Edit Default...
OK
Cancel
Apply

Figure 12-9: Configuring DCOM (Steps E)

Step F. Under **Access Permissions** (Step E), click 'Edit Limits'. Ensure 'Local Access and Remote Access' are checked for **Group or User Names** 'ANONYMOUS LOGON and 'Everyone' and click OK.

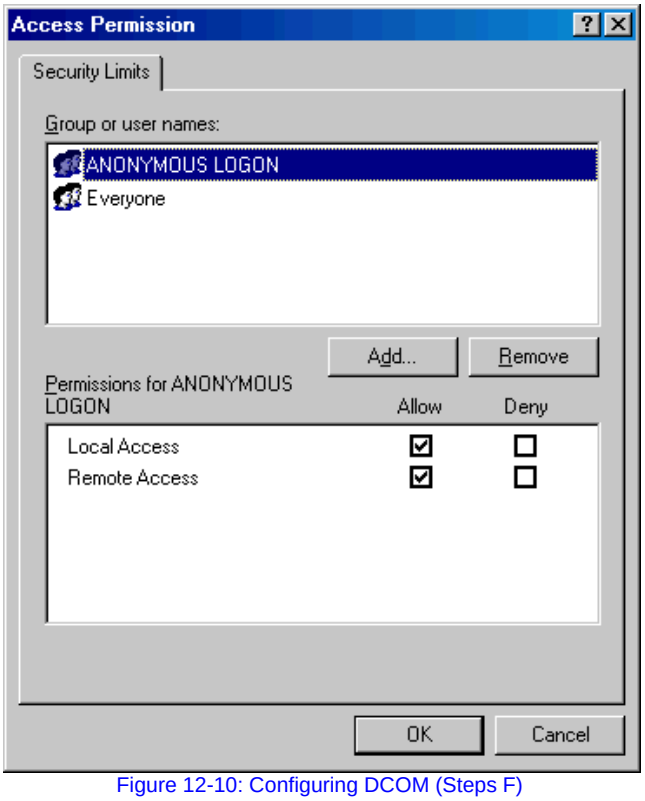


Figure 12-10: Configuring DCOM (Steps F)

Step G. Under **Launch and Activation Permissions** (Step E), click 'Edit Limits'. Select the 'Everyone' user and check 'Allow' for 'Permissions for Everyone'.

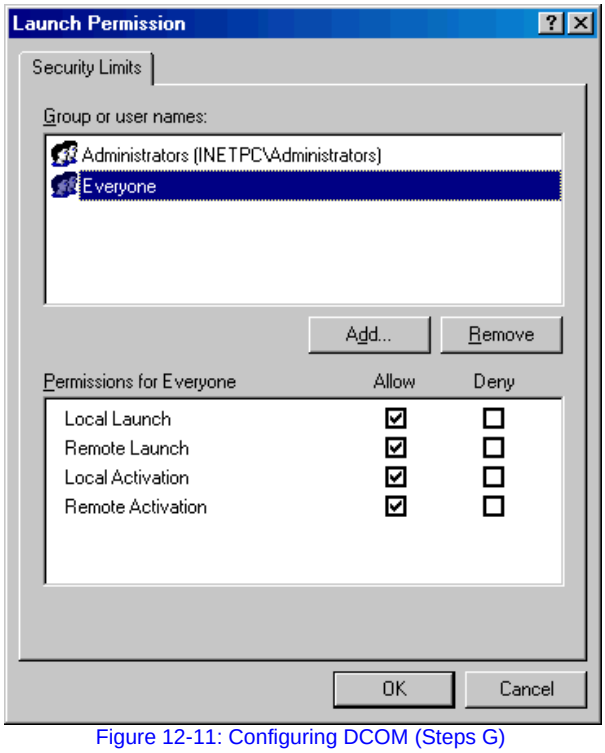


Figure 12-11: Configuring DCOM (Steps G)

Step H. For both **Access Permissions** and **Launch and Activation Permissions** (Step E), click Edit Defaults and make the same changes that were made in Step F (Access Permissions) and Step G (Launch and Activation Permissions).

Step I. Click OK to save changes to DCOM.

12.3.2 Configure DCOM for OPCEnum (Server PC)

OPCEnum is used by OPC clients to browse available OPC servers. Use the following steps to configure the OPCEnum DCOM component.

Step A. In Windows, click on Start → Run, type **dcomcnfg** and then click OK.
Step B. Under Component Services, expand Computers → My Computer → DCOM Config.
Step C. Right-Click OpcEnum and choose properties.
Step D. In the **General** tab, select an 'Authentication' Level of 'None'.

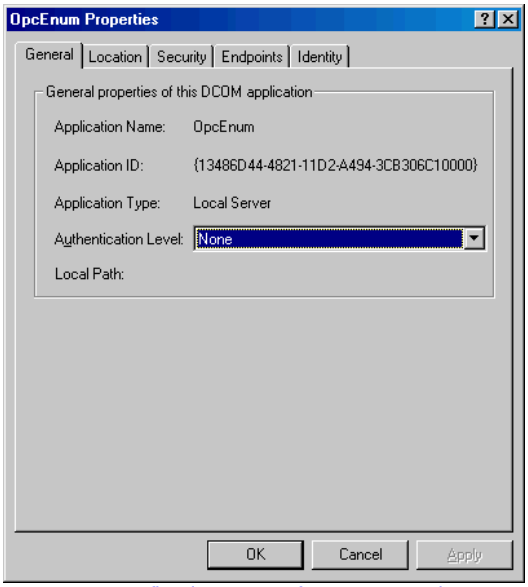


Figure 12-12: Configuring DCOM for OPCEnum (Steps A-D)

Step E. In the **Location** tab, choose 'Run application on this computer'. Do not make more than one selection.

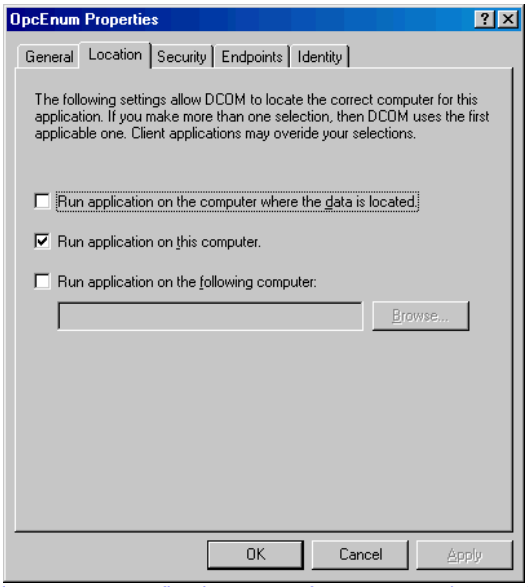

OpcEnum Properties
General
Location
Security
Endpoints
Identity
The following settings allow DCOM to locate the correct computer for this application. If you make more than one selection, then DCOM uses the first applicable one. Client applications may overide your selections.
Run application on the computer where the data is located.
Run application on this computer.
Run application on the following computer:
Browse...
OK
Cancel
Apply

Figure 12-13: Configuring DCOM for OPCEnum (Steps E)

Step F. Click on the **Security** tab. Select 'Use Default' for 'Launch and Activation Permissions' and 'Access Permissions', and Select 'Customize' for the 'Configuration Permissions'. Click the Edit button under Configuration Permissions to edit permissions.

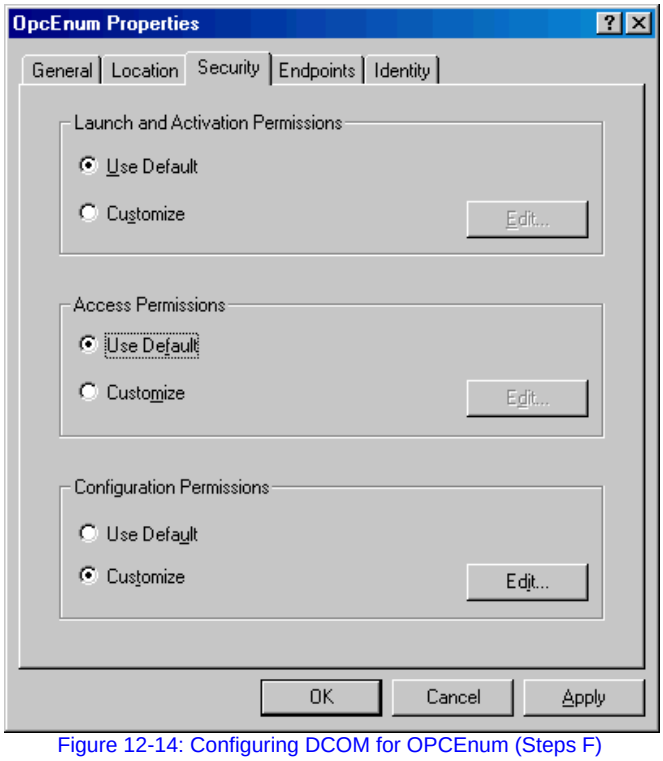


Figure 12-14: Configuring DCOM for OPCEnum (Steps F)

Step G. For **Everyone** that may launch OPCEnum, set permissions to 'Full Control (Allow) and Read (Allow)'. Click OK to save changes.

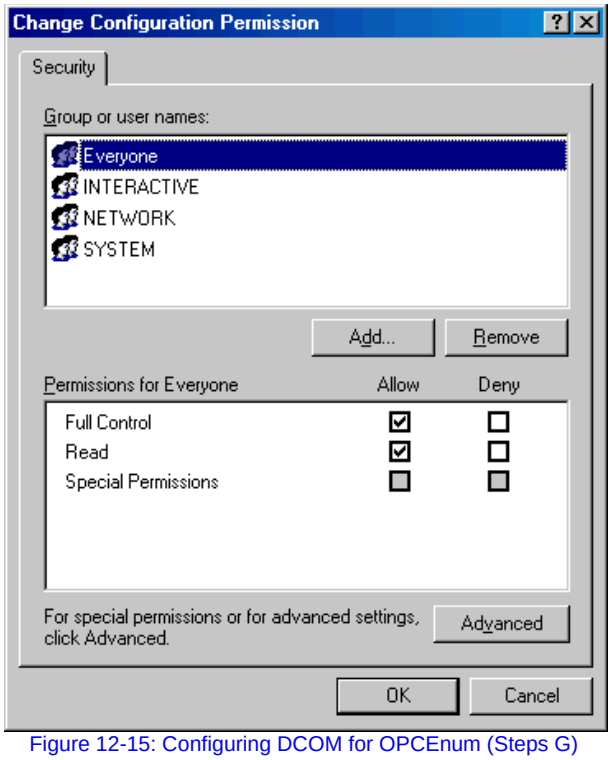


Figure 12-15: Configuring DCOM for OPCEnum (Steps G)

Step H. In the **Identity** tab, you can select anyone of the options. We recommend you use either 'The launching user' or 'The System Account (services only)'.

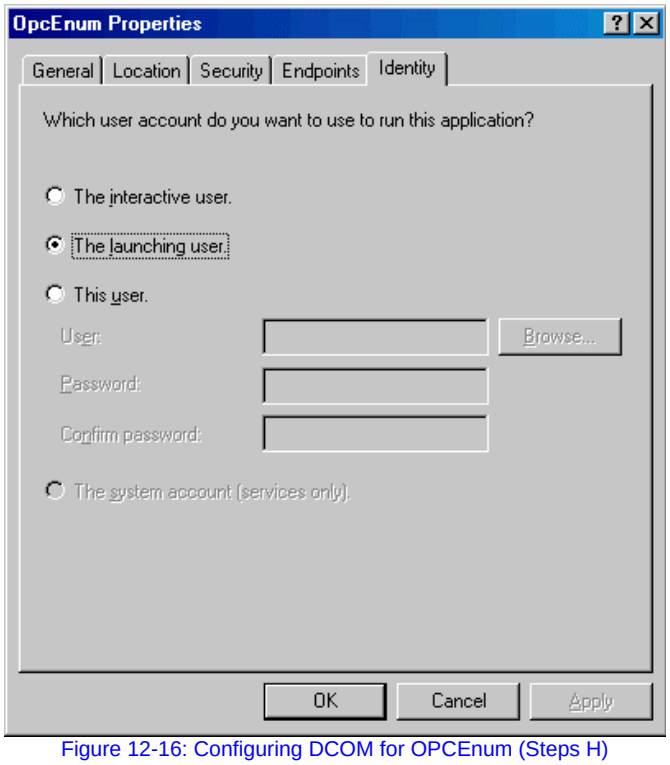


Figure 12-16: Configuring DCOM for OPCEnum (Steps H)

12.3.3 Configure DCOM for OPCEnum (Client PC)

OPCEnum is used by any OPC clients to browse available OPC servers. Use the following steps to configure the OPCEnum DCOM component.

Step A. In Windows, click on Start → Run, type **dcomcnfg** and then click OK.
Step B. Under Component Services, expand Computers→ My Computer→ DCOM Config.
Step C. Right-Click OpcEnum and choose properties.
Step D. In the **General tab**, select an 'Authentication Level' of 'None'.

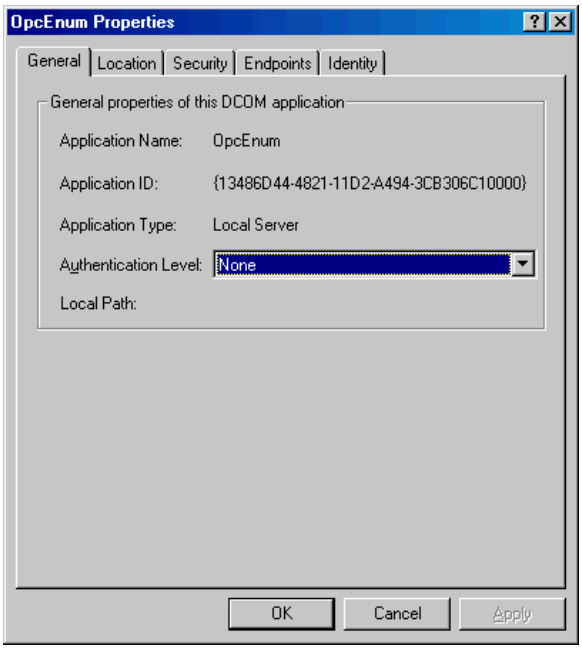


Figure 12-17: Configuring DCOM for OPCEnum (Client: Steps A-D)

Step E. In the **Location** tab, choose 'Run application on the following computer' and enter the name of the 'Server PC', in this example 'SERVER_PC'. Do not make more than one selection in this dialog.

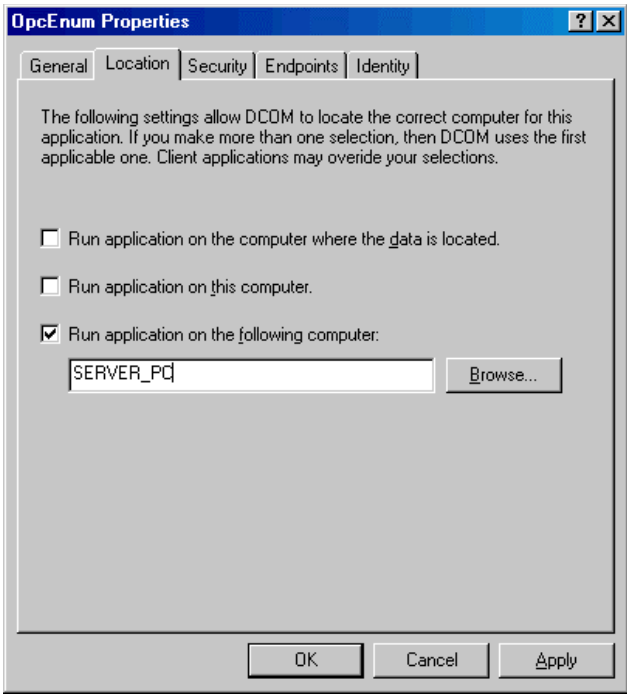

OpcEnum Properties
General
Location
Security
Endpoints
Identity
The following settings allow DCOM to locate the correct computer for this application. If you make more than one selection, then DCOM uses the first applicable one. Client applications may overide your selections.
Run application on the computer where the data is located.
Run application on this computer.
Run application on the following computer:
SERVER_PC
Browse...
OK
Cancel
Apply

Figure 12-18: Configuring DCOM for OPCEnum (Client: Step E)

Step F. In the **Security** tab, Select 'Use Default' for 'Launch and Activation Permissions, Access Permissions' and 'Customize' for the 'Configuration Permissions'. Click the Edit button under Configuration Permissions to edit permissions.

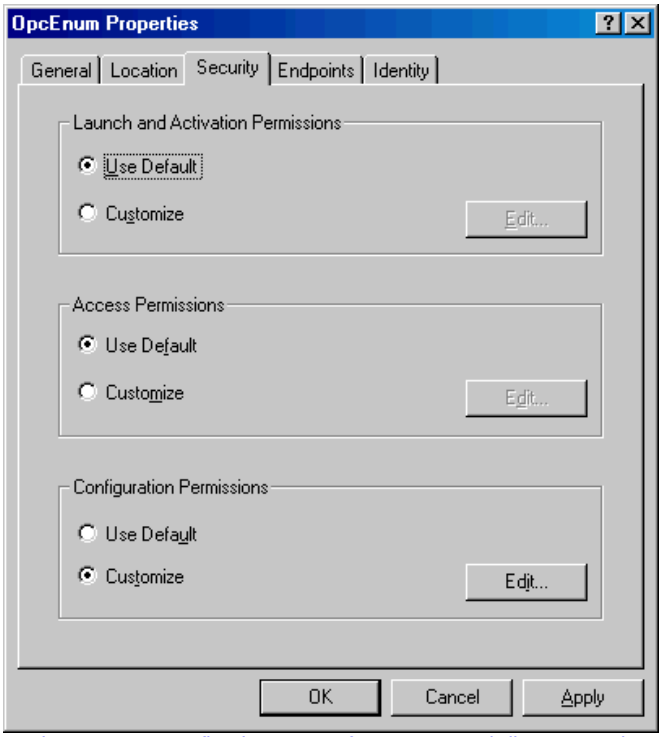


Figure 12-19: Configuring DCOM for OPCEnum (Client: Step F)

Step G. For 'each user' that may launch OPCEnum, set permissions to 'Full Control (Allow) and Read (Allow)'. Click OK to save changes.

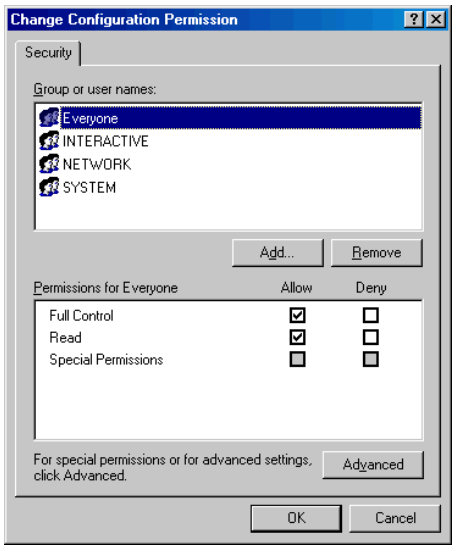


Figure 12-20: Configuring DCOM for OPCEnum (Client: Step G)

Step H. In the **Identity** tab, you can select either of the options. It is recommended to use either 'The launching user or The System Account (services only)'.

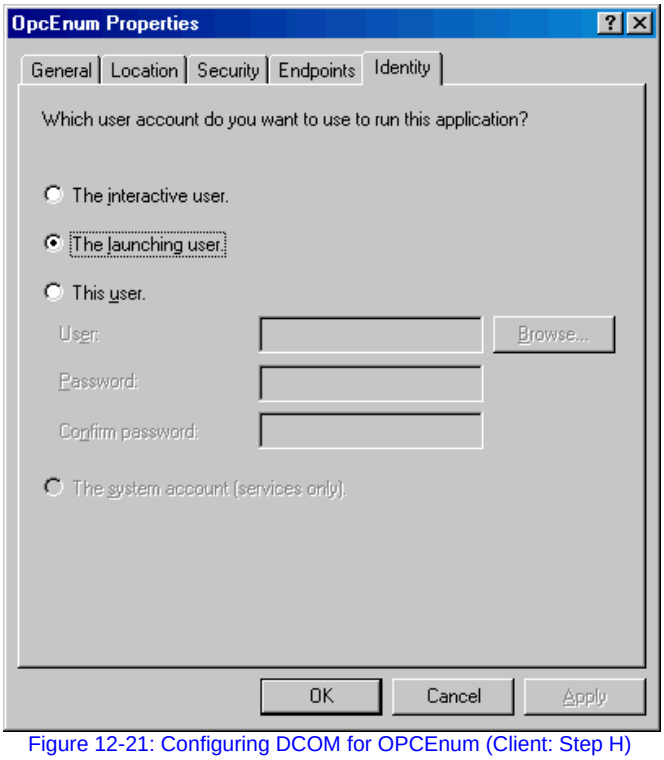


Figure 12-21: Configuring DCOM for OPCEnum (Client: Step H)

12.3.4 Domains vs. Workgroups

When using OPC over DCOM in a Windows environment, the type of network that is being used (Domain or Workgroup) determines how DCOM handles and authenticates users.

Domains:
In a Domain configuration, there is a Network Server where all user accounts are stored. When DCOM needs to authenticate a user, it contacts the Network Server (Note: this is usually a different PC than the OPC Server) and uses the accounts/configuration information that was setup using

dcomcnfg in sections 1 and 2. In a Domain configuration dealing with OPC over DCOM, no special action needs to be taken.

Workgroups:

In a Workgroup configuration, there is no main server that handles user authentication. Each computer has it's own security and account settings. This can cause problems with DCOM as the user accounts on each PC are usually different.

In order for DCOM to work in this network configuration, each computer must have the same User Account information (Username/Password) for any user that will be running/accessing the OPC Server/OPCEnum over the network.

12.3.5 DCOM over TCP/IP Protocol with NetBIOS

It is important when using DCOM over TCP/IP that you have the NetBIOS option enabled. Without NetBIOS, DCOM will not be able to browse remote computers. Use the following steps to enable NetBIOS in TCP/IP.

Step A. Click Start → Settings → Network Connections.
Step B. Right-Click your Network Card and click Properties.
Step C. Select Internet Protocol (TCP/IP) and click the Properties button.

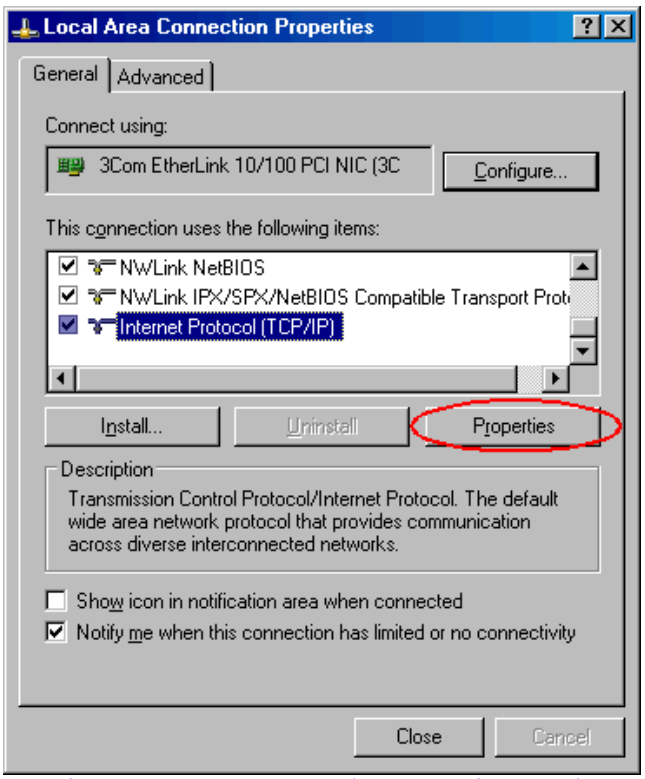


Figure 12-22: DCOM over TCP/IP-NetBIOS (Steps A-C)

Step D. In **Internet Protocol (TCP/IP) Properties** click the Advanced button as shown below.

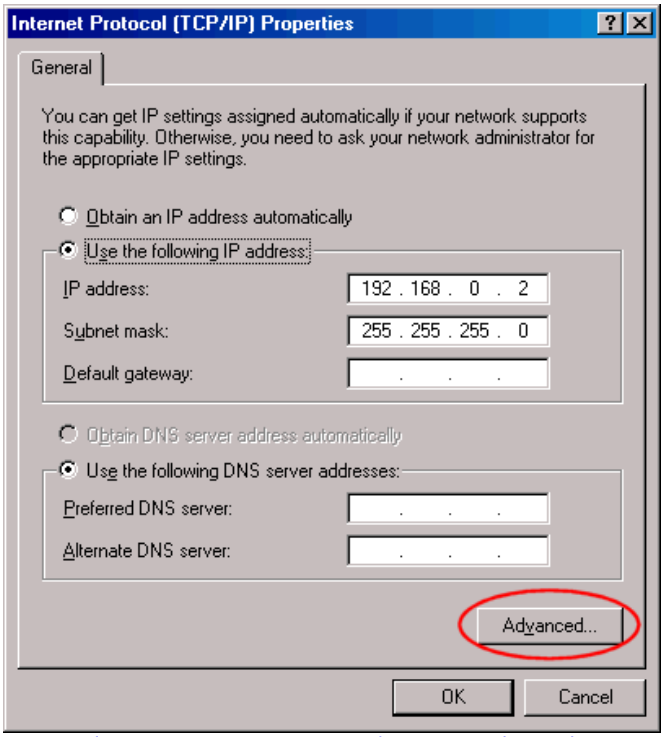

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 0 . 2
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Figure 12-23: DCOM over TCP/IP-NetBIOS (Step D)

Step E. In **Advanced TCP/IP Settings**, choose the 'WINS' tab and choose 'Enable NetBIOS over TCP/IP'.

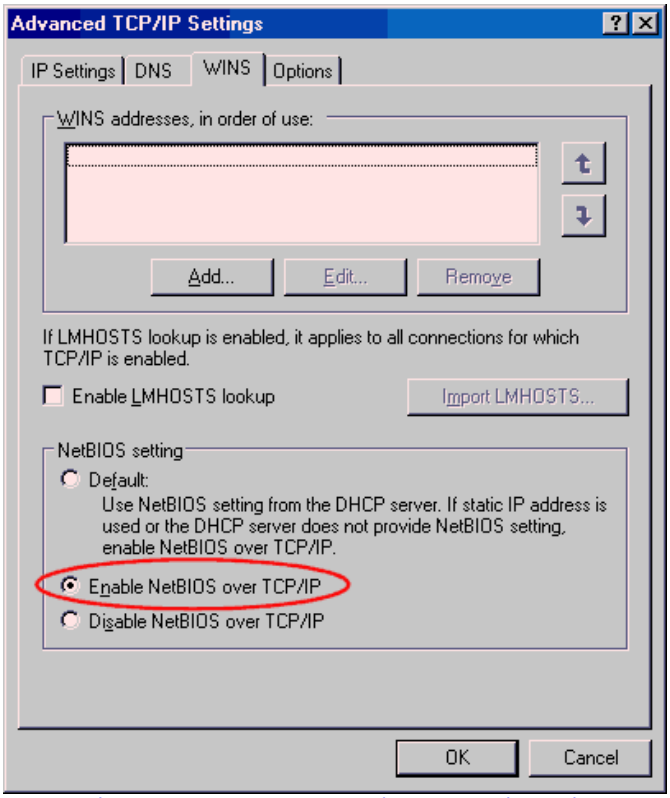

Advanced TCP/IP Settings
IP Settings
DNS
WINS
Options
WINS addresses, in order of use:
Add...
Edit...
Remove
If LMHOSTS lookup is enabled, it applies to all connections for which TCP/IP is enabled.
Enable LMHOSTS lookup
Import LMHOSTS...
NetBIOS setting
Default:
Use NetBIOS setting from the DHCP server. If static IP address is used or the DHCP server does not provide NetBIOS setting, enable NetBIOS over TCP/IP.
Enable NetBIOS over TCP/IP
Disable NetBIOS over TCP/IP
OK
Cancel

Figure 12-24: DCOM over TCP/IP-NetBIOS (Step E)

Step F. Click OK to close the Advanced TCP/IP Settings dialog, then click OK to close the Internet Protocol (TCP/IP) Properties dialog. Click Close to close the Network Connections dialog.

12.4 Example: DCOM for UniOPC Server

12.4.1 Configure DCOM on Server PC

UniOPC Server, is the OPC server for Unitronics controllers. Use the following steps to configure the UniOPC DCOM component.

Step A. In Windows, click on Start → Run, type **dcomcnfg** and then click OK.
Step B. Under Component Services, expand Computers→ My Computer →DCOM Config.
Step C. Right-Click UniOPC and choose properties.
Step D. In the **General** tab, select an 'Authentication Level' of Default.

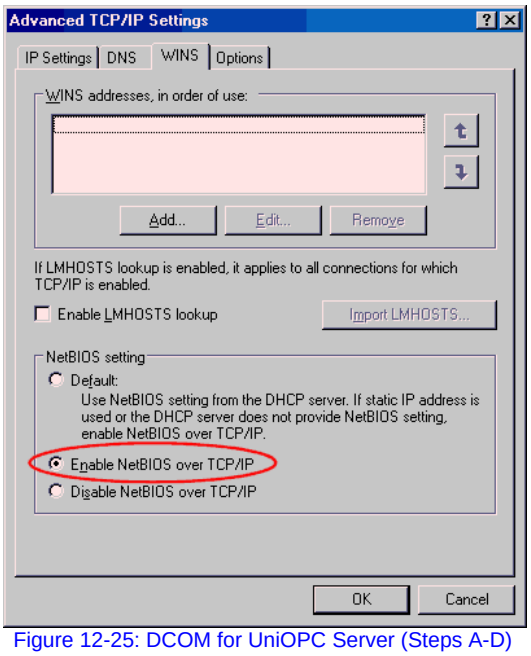

Advanced TCP/IP Settings
IP Settings
DNS
WINS
Options
WINS addresses, in order of use:
Add...
Edit...
Remove
If LMHOSTS lookup is enabled, it applies to all connections for which TCP/IP is enabled.
Enable LMHOSTS lookup
Import LMHOSTS...
NetBIOS setting
Default:
Use NetBIOS setting from the DHCP server. If static IP address is used or the DHCP server does not provide NetBIOS setting, enable NetBIOS over TCP/IP.
Enable NetBIOS over TCP/IP
Disable NetBIOS over TCP/IP
OK
Cancel

Figure 12-25: DCOM for UniOPC Server (Steps A-D)

Step E. In the **Location** tab, choose 'Run application' on this computer. Do not make more than one selection.

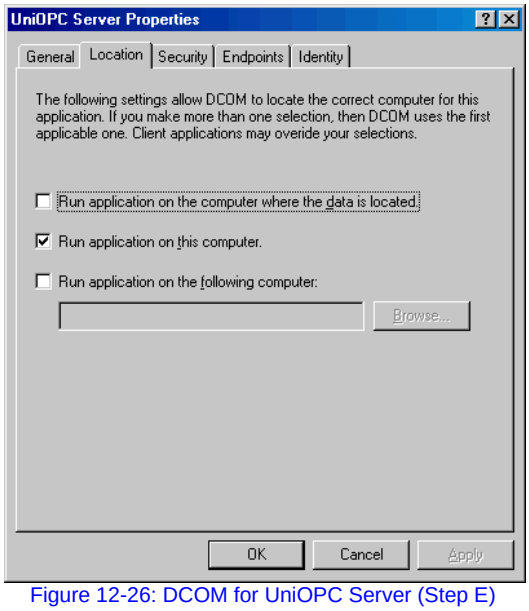

UniOPC Server Properties
General
Location
Security
Endpoints
Identity
The following settings allow DCOM to locate the correct computer for this application. If you make more than one selection, then DCOM uses the first applicable one. Client applications may overide your selections.
Run application on the computer where the data is located.
Run application on this computer.
Run application on the following computer:
Browse...
OK
Cancel
Apply

Figure 12-26: DCOM for UniOPC Server (Step E)

Step F. In the **Security** tab, Select 'Use Default' for 'Launch and Activation Permissions' and 'Access Permissions' and 'Customize' for the 'Configuration Permissions'. Click the Edit button under 'Configuration Permissions' to edit permissions.

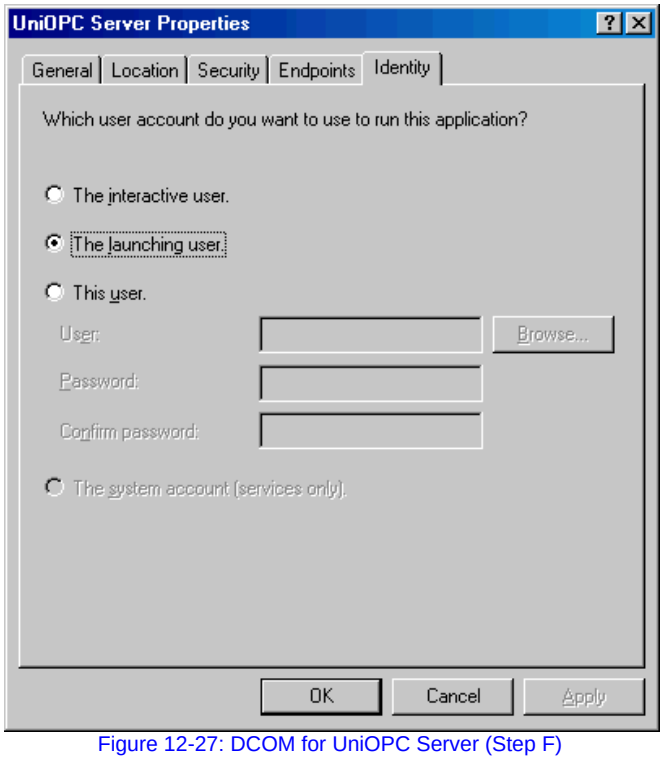


Figure 12-27: DCOM for UniOPC Server (Step F)

Step G. For **Everyone** that may launch OPCEnum, set permissions to 'Full Control (Allow) and Read (Allow)'. Click OK to save changes.

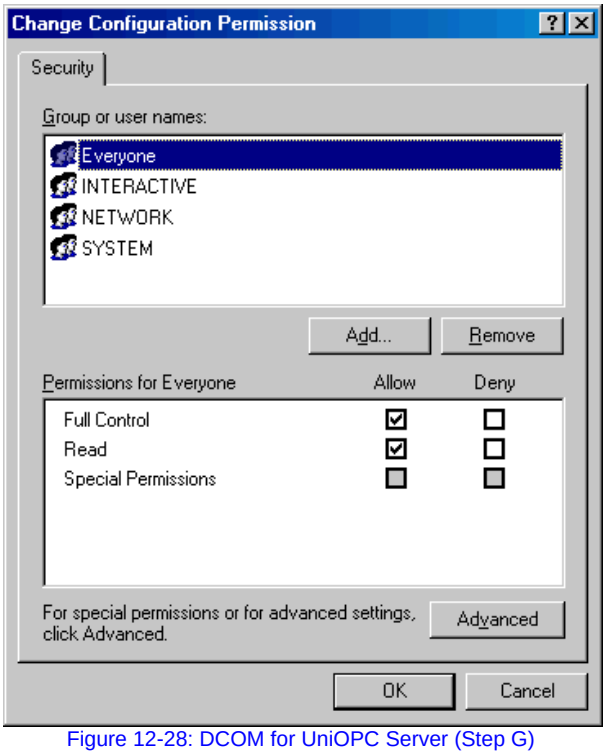


Figure 12-28: DCOM for UniOPC Server (Step G)

Step H. In the **Identity** tab, you can select either of the options. It is recommended to use either 'The launching user' or 'The System Account (services only)'.

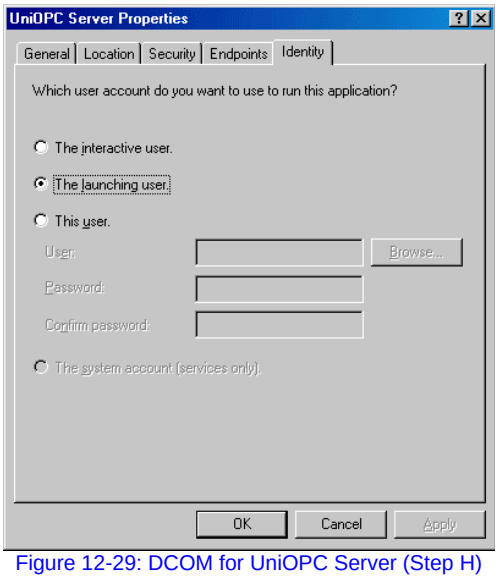


Figure 12-29: DCOM for UniOPC Server (Step H)

12.4.2 Configure DCOM on Client PC

When using OPC over DCOM it is necessary for the Client PC to know the program name of the OPC Server on the Server PC. This allows the Client PC to remotely launch the Server PC's OPC Server using DCOM. Before proceeding install an OPC Server on your Client PC (See Example in Section 12.2).

UniOPC Server, is the OPC server for Unitronics controllers. Use the following steps to configure the UniOPC DCOM component.

Step A. In Windows, click on Start → Run, type **dcomcnfg** and then click OK.
Step B. Under Component Services, expand Computers→ My Computer→ DCOM Config.
Step C. Right-Click UniOPC and choose properties.
Step D. In the General tab, select an Authentication Level of Default.

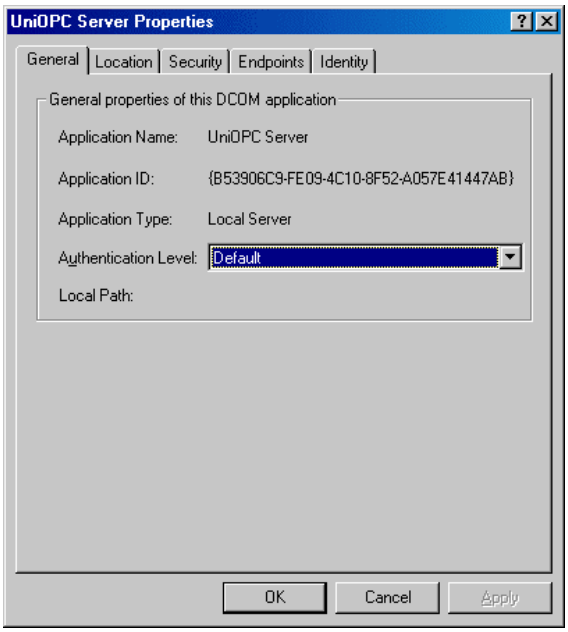


Figure 12-30: DCOM for UniOPC Server (Client Steps A-D)

Step E. In the **Location** tab, choose 'Run application on the following computer' and enter the name of the 'Server PC', in this example SERVER_PC. Do not make more than one selection in this dialog.

OpcEnum Properties
General
Location
Security
Endpoints
Identity
The following settings allow DCOM to locate the correct computer for this application. If you make more than one selection, then DCOM uses the first applicable one. Client applications may overide your selections.
Run application on the computer where the data is located.
Run application on this computer.
Run application on the following computer:
SERVER_PC
Browse...
OK
Cancel
Apply

Figure 12-31: DCOM for UniOPC Server (Client Step E)

Step F. In the **Security** tab, Select 'Use Default for Launch and Activation Permissions' and 'Customize' for the 'Configuration Permissions'. Click the Edit button under Configuration Permissions to edit permissions.

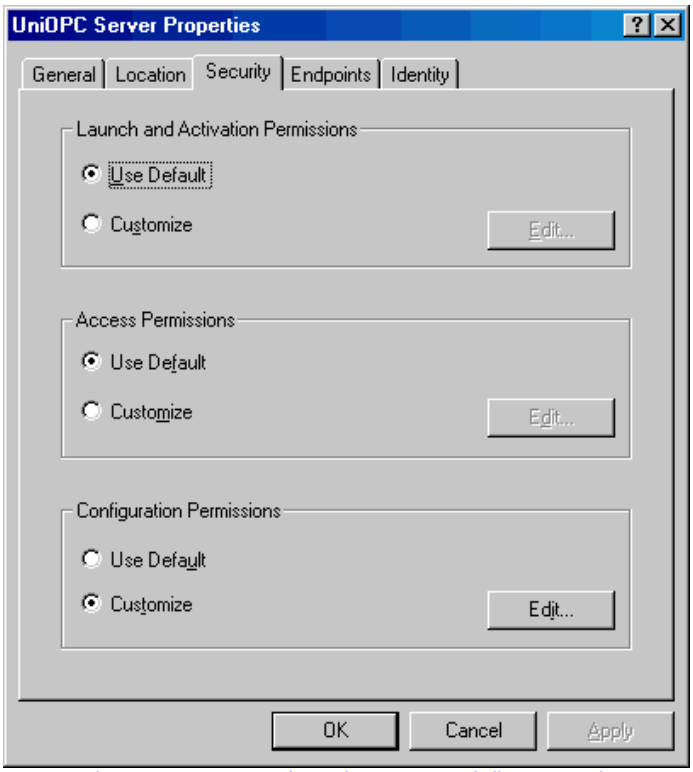


Figure 12-32: DCOM for UniOPC Server (Client Step F)

Step G. For 'each user' that may launch OPCEnum, set permissions to 'Full Control (Allow) and Read (Allow)'. Click OK to save changes.

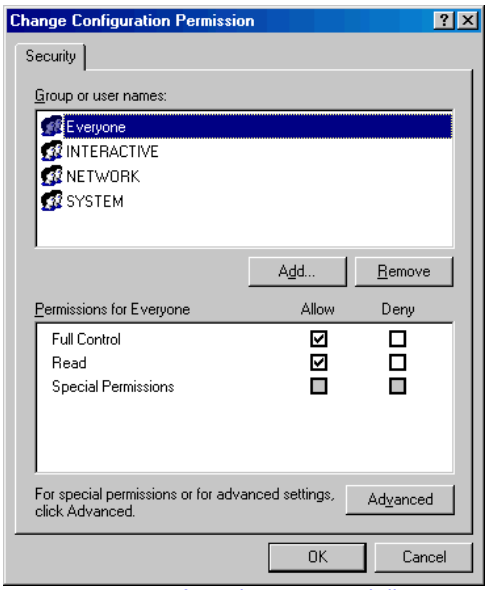


Figure 12-33: DCOM for UniOPC Server (Client Step G)

Step H. In the **Identity** tab, you can select either of the options. It is recommended to use either 'The launching user' or 'The System Account (services only)'.

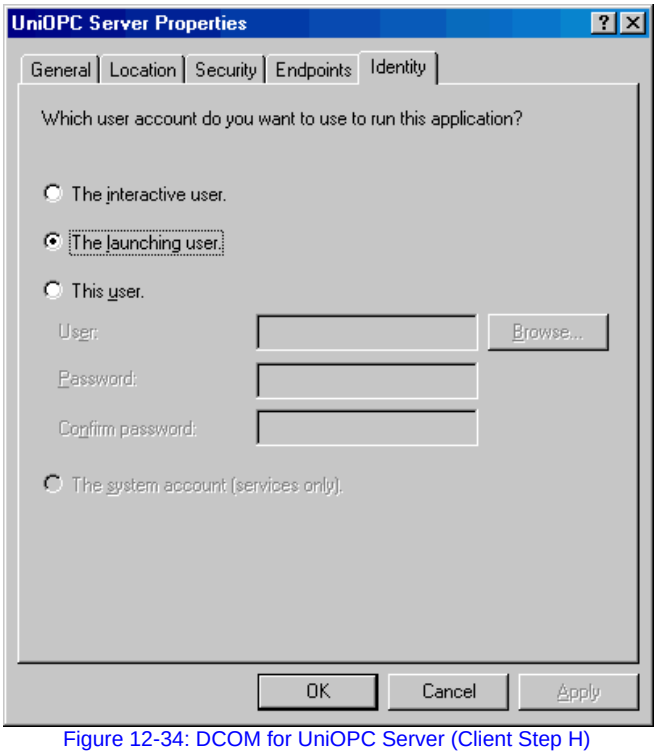


Figure 12-34: DCOM for UniOPC Server (Client Step H)

13 Historic Trend Utility

IHMITrend Historic Trend Utility is a software option (that can be activated on the Designer PC or any other PC), which provides you with a graphical representation of data logged by InstantHMI Runtime. The IHMITrend Utility discussed in this section will enable you to select data items, time periods, and data formats (Line or Scattered symbol graphs). Data interpolation may be done using Linear or Spline algorithm. To view your database in IHMITrend a trend profile must be created. A trend profile will include the name of the source database, pen assignments, labels, colors, fonts, etc. The same database data may be displayed using several different profiles.

13.1 Datalog Database Considerations

When using a PC runtime engine, the datalog will be saved in a Database (Access database IHMIDatalog.MDB or MySQL) depending on the DSN (Data Source Name) configuration. When using a PDA or Win CE runtime engine, the datalogs will be saved in datalog files for each tag (TagName.idb), which can then be converted using the PC LaunchPad to the datalog database depending on the DSN (Access database IHMIDatalog.MDB or MySQL) (as well as a .CSV file, in some cases). The Datalog database may be used for historical trending or other analysis using tools available to you. (Note that your copy of InstantHMI LaunchPad must have the Historical trending option installed for the logged data to be useful for trending analysis.)

Figure 13-1 summarizes the role played by the ODBC drivers (MS Jet Engine for Access database and ODBC Connector for MySQL database) using Data Source Name to link the Datalog Database with the Historic Trending Utility.

Note: Do not confuse 'Data Source Name' (DSN) here in the ODBC setup with the name of the 'Data Source' for communications discussed elsewhere (Section 2.3.5).

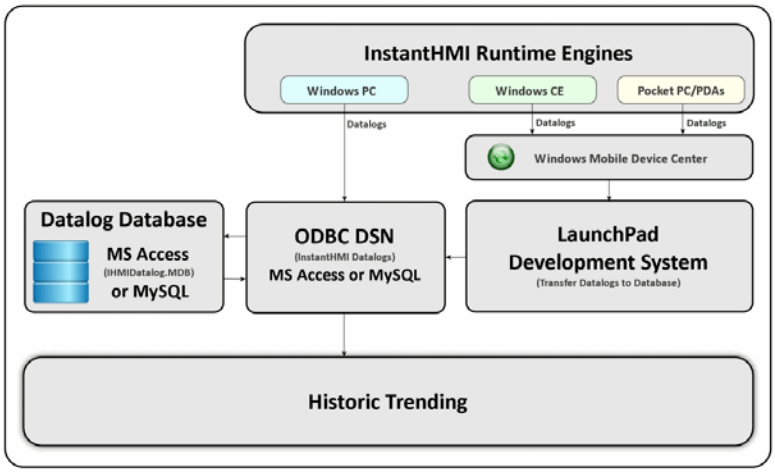


Figure 13-1: Historic Trending and ODBC Database

When using a PC runtime engine, the Datalog Database maybe an MSAccess database (IHMIDatalog.MDB) or a MySQL database. InstantHMI Runtime Engines running on different PCs can log data and store the datalogs using the properly configured DSN into the Datalog Database on a Server PC; these datalogs may then be retrieved using an appropriate DSN from one or more PCs running the InstantHMI Historic Trend Utility (IHMITrend) as shown in Figure 13-2.

Note: InstantHMI Historic Trend Utility (IHMITrend) creates a temporary DSN (named 'InstantHMI Datalogs_HTrend', which is initially a clone of your DSN), which you may then point to different databases to open and view in the plot area. This allows data to be logged without interruption by the Runtime. When it comes time to archive/backup the Datalog Database, and the database is in use by the Historic Trending Utility, the Runtime flashes a message that 'Database is locked and in use' and needs to be unlocked by exiting the Historic Trend Utility, so archive/backup can proceed.)

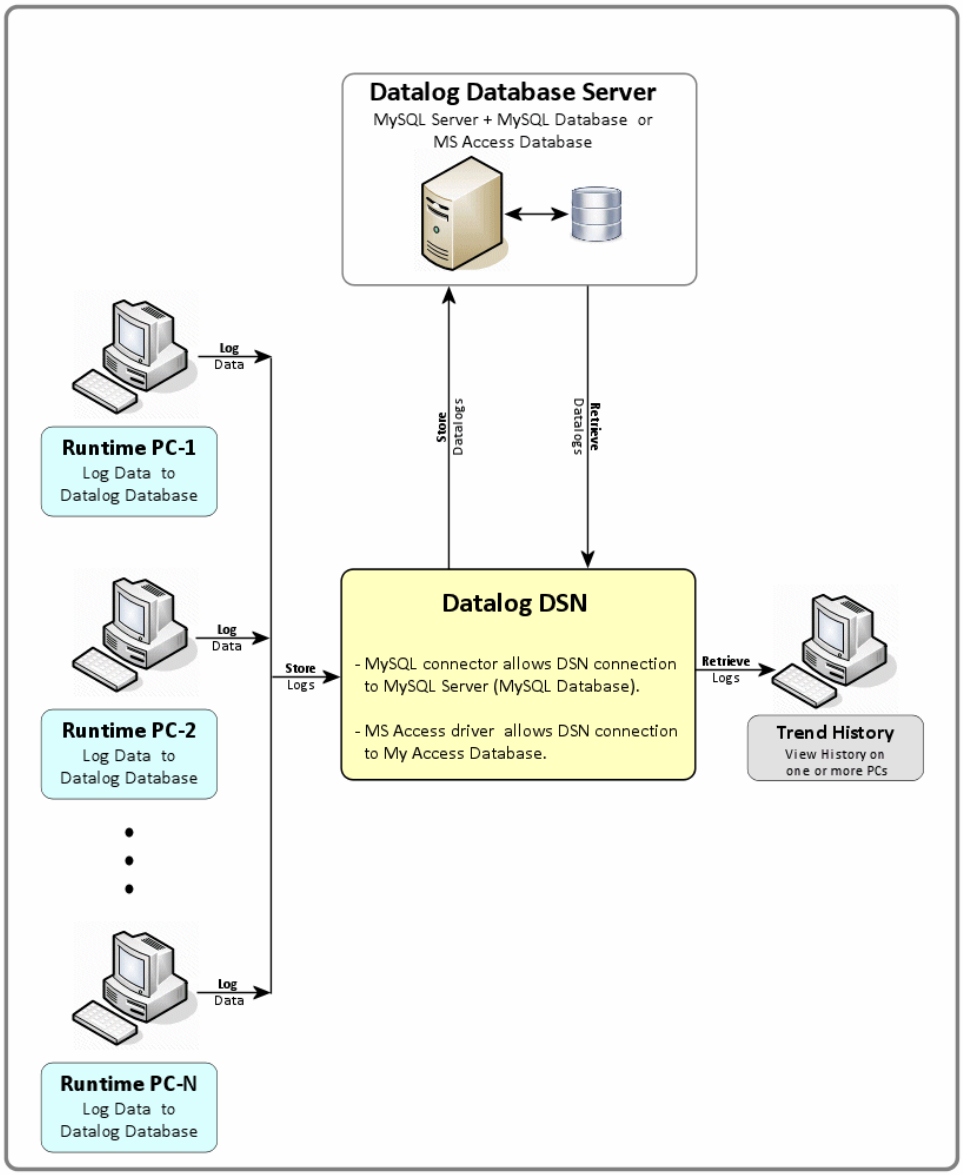


Figure 13-2: InstantHMI Datalog Database

13.2 Installation Considerations

The IHMITrend Historic Trending utility is included as part of the standard InstantHMI software download delivered over the Internet.

Step 1. Make sure the InstantHMI LaunchPad software is installed on your PC, if not, do so first (see Appendix A.2). This will also install IHMITrend utility. Verify that the following files are in your InstantHMI LaunchPad (or IHMITrend) installation folder (usually **C:\IHMI-6**).

IHMITrend Installation Files		
IHMITREND	EXE	IHMITrend Utility
QCBASED	DLL	Required DLL
QCBSEF	DLL	Required DLL
QCRTD	DLL	Required DLL
QCRTF	DLL	Required DLL
WCT32D	DLL	Required DLL

Step 2. Verify that the DSN is setup properly for MS Access (Section 3.7.5) or MySQL (Section 3.7.6).

For MSAccess the following files will be in your InstantHMI Project Datalog folder (usually **C:\IHMI-6\MyProject**, where MyProject is your project name in the LaunchPad Software.

IHMITrend Datalog Database Files		
IHMIDatalog	MDB	Default IHMITrend Database
IHMIDatalog-Default	MDB	Empty IHMITrend Database

Note: The IHMIDatalog.MDB in your project directory (pointed to by the MS Access DSN) is the database that InstantHMI LaunchPad will use to transfer logged data from other runtime platforms (such as Pocket PC) to LaunchPad PC.

Step 3. Verify ODBC DSN (Data Source Name) setup. See details for MS Access (Section 3.7.5) or for MySQL (Section 3.7.6).

Historic trending utility on your LaunchPad PC should now be configured properly.

13.3 IHMITrend Program Elements

Click on 'LaunchPad → Design → Reports → Historic Trend Profiles' and then click on Historic Trend Utility button to run the IHMITrend. Alternatively, (especially when you exit from Runtime and return to LaunchPad) you may click on 'LaunchPad → Run → Reports', select Datalog Trend History and then click on Trend History button to run the IHMITrend. A second alternative is creating a short-cut to run directly the IHMITrend.exe program.

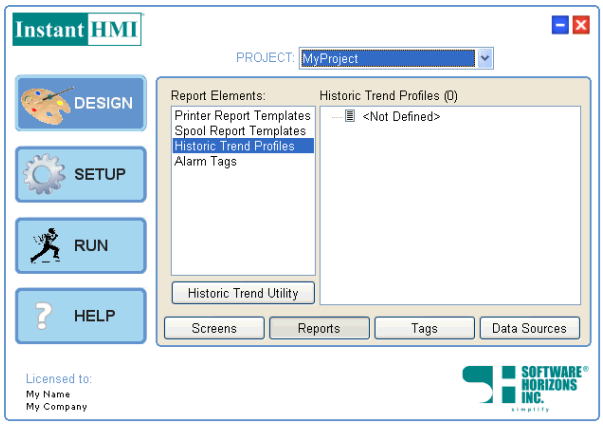


Figure 13-3: Run Historic Trend Utility

13.3.1 IHMITrend Window

When you run the IHMITrend Historic Trend Utility, you will see the **IHMITrend** window.

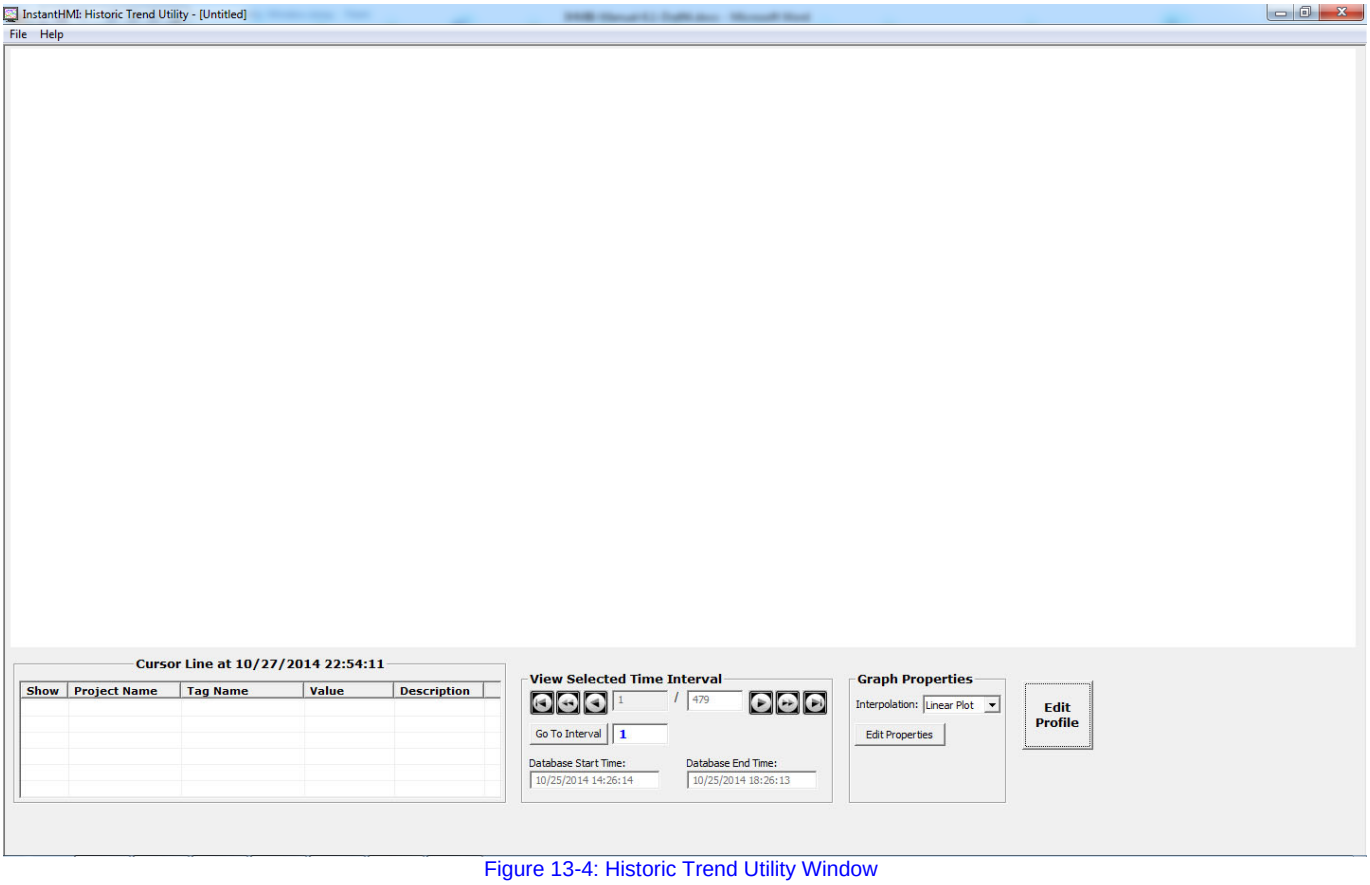


Figure 13-4: Historic Trend Utility Window

The IHMITrend window has a Title Bar and a Main Menu at the top. Below the Main Menu there is a Plot area to display the trend graphs, a tabular display of Pens, navigation buttons to scroll graphically through the database, Graph Property fields and a button to edit current Profile.

13.3.2 Profile Specification Dialog

Initially, IHMITrend displays no plot but pops-up a 'Profile Specification' dialog.

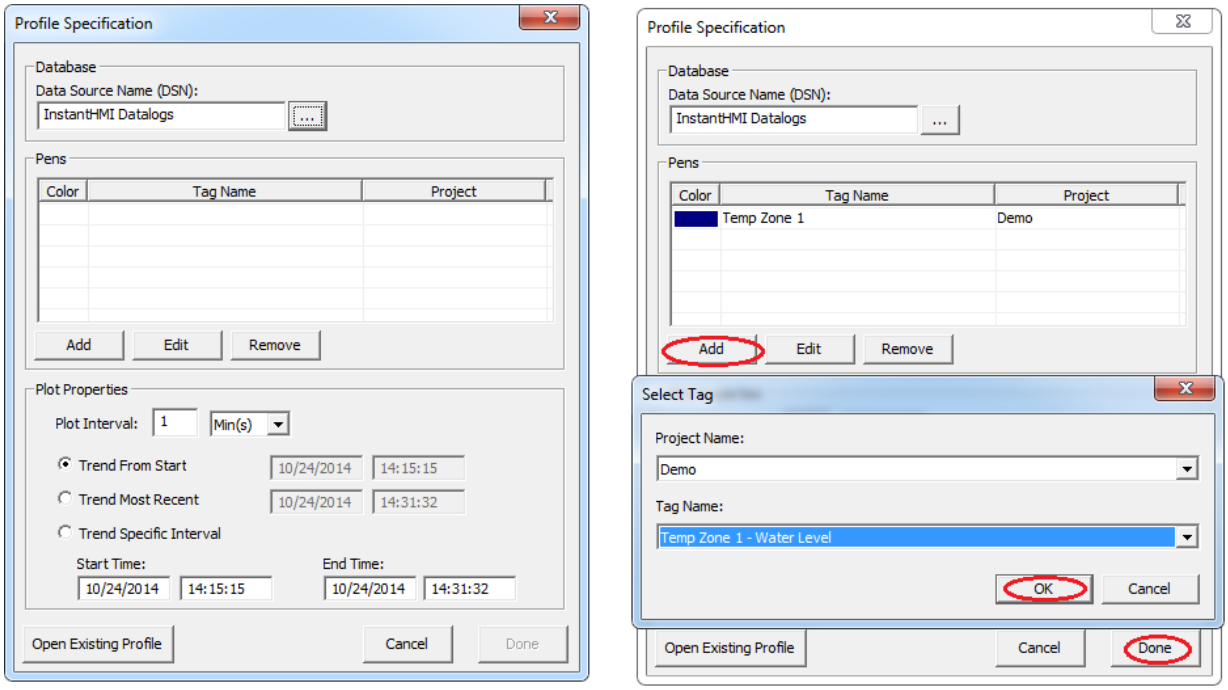


Figure 13-5: Profile Specification Dialog : Add Pen1 (Tag 'Temp Zone1') and Pen 2 (Tag 'Water Level')

Any Profile specification includes three major elements:

- Database (pointed to by the DSN) where datalogs are stored,
- Pens (which plot the data for the associated Tags logged in the database), and
- Time Interval (for which the available Tag data are to be displayed on the Plot).

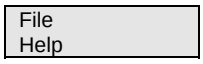
Other profile elements include Graph Properties (such as Title Text attributes, Grid attributes, etc.) The 'Profile Specification' dialog initially shows empty fields except for some of the database parameters (Data Source Name, Start Time and End Time for the data stored in the database).

Click on ‘Open Existing Profile' button to choose one of the previously created profiles. Otherwise, to create a new profile, click on Add button to select a Tag to associate with the first Pen; repeat until you have defined a Pen for each of the Tags (upto a maximum of 16) you wish to include in the trend history plot. Click on ‘Done’ button to view the plot.

If you are just creating a new profile, the vertical scale of the plot, which defaults to 0-100, may not be suitable. To change the y-scale or any other ‘Plot Properties’ click on the button labeled ‘Graph Properties’ (see detailed example in Section 13.4.3). When you are reasonably happy with the displayed plot (and hence the Profile) save it using appropriate commands executed from the File Menu.

13.3.3 Main Menu

The menu bar lists the main menu commands:



You will be using the main menu and other menu commands to create your Trend Profiles. Use the context sensitive help by pressing the help key F1 after highlighting any menu item; this will display the contextual help about the menu item selected.

13.3.4 File Menu

The File Menu offers the following commands

New Profile	Create new trend profile
Open Profile	Open existing trend profile
Close Profile	Close currently open trend profile
Save Profile	Save currently open trend profile
Save Profile As	Save currently open trend profile using different file name
Print Window	Print currently open trend plot
Print Options	Set Print Parameters
Print Setup…	Set up default printer parameters
1	Four
2	Most recently
3	Used
4	Profiles
Exit	Exit IHMITrend Historic Trend Utility

Use **File → New Window** (Ctrl + N) command to create a new Trend Profile in IHMITrend. You may click on the tool bar button or press the short cut key Ctrl+N instead of using the menu choice to execute File New command. Be sure to save the current file if you want to preserve any changes. After saving the current file, a new (blank) screen is presented.

Use **File → Open Profile** command to open an existing profile. You may click on the tool bar button or press the shortcut key Ctrl + O instead of using the menu choice to execute File Open command. You will see a File Open Dialog box, which allows you to specify which profile file to open. Type or select the File Name you want to open. This box lists files with the extension you select in the 'List Files of Type' box (default is *.prf). Select the Folder (directory) in which IHMITrend will find the profile that you want to open.

Use **File → Close Profile** command to close the current profile.

Use **File → Save Profile** command to save the current profile to its current name and directory. You may click on the tool bar button or press the shortcut key Ctrl + S instead of the menu choice to execute the File Save command. When you save a profile for the first time, a Save As Dialog box is displayed so you can name it. If you want to change the name and/or directory of an existing profile, choose the Save As command.

Use **File → Save Profile As** command to name and save the current profile. (To save a profile with its existing name and directory, use the Save command.) Type or select the profile File Name you want to save as. A .PRF extension is assigned to any profile you save. Select the Folder (directory) where you wish to store the profile.
Use **File → Print Window** command to print the trend for the current profile on your printer. Windows Print Manager takes care of the printing details by presenting a Print Dialog Box. If your printer is not setup correctly use the Print Setup command.

Use **File → Print Options** command to setup print parameters. If you select Exact Size for Printing Style then you may locate the upper left corner of the plot on the printed page by entering a value for the Left % and Right %. Note: Print options are provided for you to experiment with to see if you can obtain more desirable results.

Use **File → Print Setup** command to setup your printer for printing. Windows Print Manager takes care of the printer setup details by presenting a Print Setup Dialog Box.

13.3.5 Help Menu

The Help menu offers the following information about IHMITrend.

Table of Contents	Displays Historic Trend Topics
About IHMITrend	Displays the version number of IHMITrend application.

Click on **Help → About IHMITrend** to see the release information (Version # and Copyright).

13.4 Application Data for Historic Trending

13.4.1 Application Example

We will use the Temperature Zones (screens 2 & 3) from the Demo project included in your InstantHMI installation as an example to illustrate how you may use IHMITrend in your application. In this example five variables are of interest and they are set up as shown in table below for data logging. The PC runtime engine was used to log data over a four hour period.

TagName	Address Local Memory	Data Format	Datalog SampleTime
Temp Zone 1	2030	Int16	1000 msec
Temp Zone 1 – water Level	2035	Int16	1000 msec
Temp Zone 2	2013	Int16	1000 msec
Temp Zone 3	2015	Int16	1000 msec
Temp Zone 4	2099	Int16	1000 msec

13.4.2 Log Application Data

In our example, the PC runtime engine logs the Temperature and the Water Level for Zone 1 every second. The other three variables (Temperatures for Zones 2,3,4) are also logged as shown. The logged data is captured directly in the ODBC database IHMIDatalog.MDB. (If your runtime platform is other than a PC use steps below).

Transfer Logged Data from Pocket PC runtime to IHMIDatalog.MDB Database on PC
(This applies to many Windows CE platforms as well)

- Click on the LaunchPad → Reports Button. Click on the Logs tab, select the 'Pocket PC Datalogs' option and click View Datalogs Button. 'Datalog Viewer' Dialog Box will appear.
- Click on 'Transfer Datalogs' Button to transfer the datalogs from your Pocket PC and save that file under your \<Project Name>\Datalogs directory.
- When the Datalog transfer from Pocket PC is complete, a message box will appear. Select 'Yes' to transfer datalogs into the ODBC Database.
- When transfer of datalogs to ODBC database IHMIDatalog.MDB is finished click on 'OK' button on 'Datalog Viewer' dialog box.

13.4.3 Analyze Logged Data

Step 1. Run IHMITrend Utility

Click on 'LaunchPad → Design → Reports → Historic Trend Profiles' and then click on Historic Trend Utility button to run the IHMITrend. You will see the **IHMITrend** window (Figure 13-3). Note: A second alternative is creating a short-cut to run directly the IHMITrend.exe program. You will see a Profile Specification dialog.

Step 2. Create Trend Profile

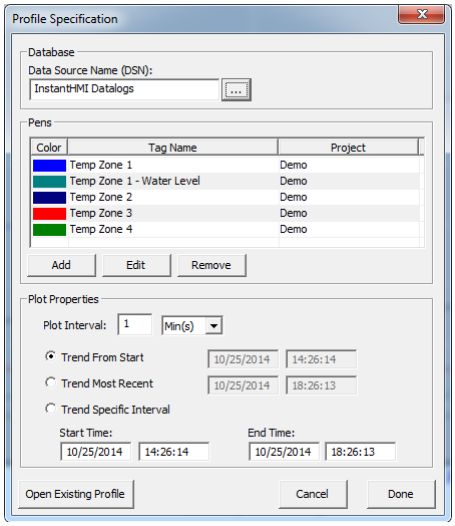


Figure 13-6: Profile for Temp Zones Example

Our Profile specification includes three major elements:

- Database IHMIDatalogs.mdb (pointed to by the DSN 'InstantHMI datalogs) where datalogs are stored,
- Five Pens (which plot the data for the five associated Tags logged in the database), and
- Plot Properties: Enter the Plot Interval and select the time units from the list. Next, select one of the following three options for trend:
  Trend From Start - Shows entire database from the Start.
  Trend Most Recent - Shows the most recent data (including end of database).
  Trend Specific Interval - Shows the data from the specified Start Time to End Time.

Click on Add button to add a Pen. To change Pen properties double click on the Pen field to access its Line Attributes dialog, where you can change Line Color, Line Marker and other attributes. Repeat this for the other pens (as required).

Step 3. View Logged Data

Once you have completed specifying the Profile, click on Done to view your data. Figure 13-7 below shows a sample trend with the profile defined in Step 2.

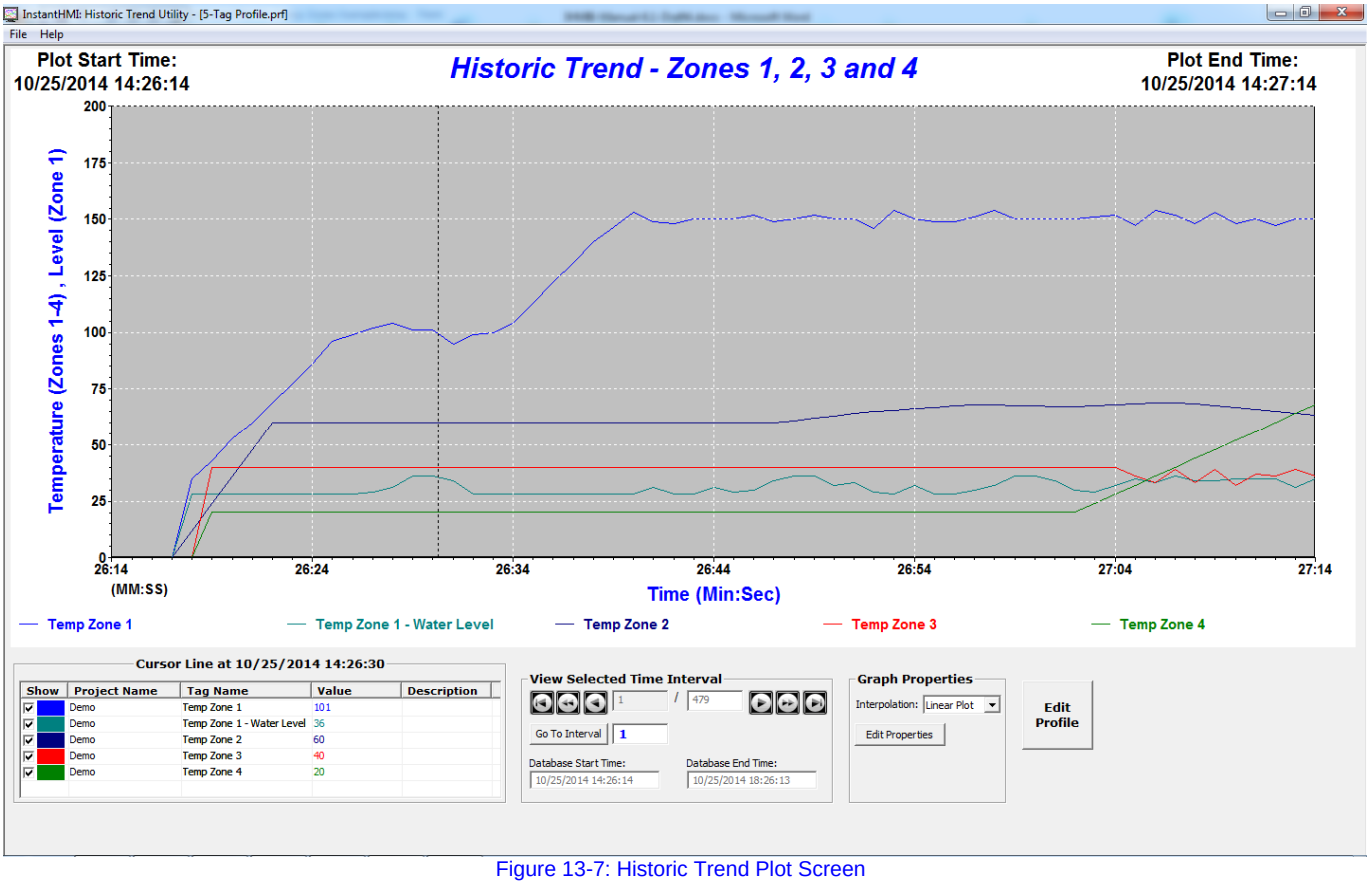


Figure 13-7: Historic Trend Plot Screen

Click on 'Edit Profile' button to make changes to the profile to get the trend plot to your liking. Click on the (left or right) scroll buttons at the bottom to scroll the trend to left or right by half a time-period. Click on Reset Plot to return to the trend plot displayed initially.

Show/Hide pen trace from Trend Charts

The 'Pens' section of the Profile Specification dialog allows the selection of up to sixteen pens for the trend charts. Set the properties of all selected pens. Once you exit the profile specification dialog by clicking 'Done' Button, you will have the option to 'Show/Hide' the trace of each pen selected. All pen traces are shown by default. You can hide a pen trace by un-checking the **'Show'** check box field.

The ability to toggle the Show / Hide state of the trace of the pen is helpful when the plot traces overlap. Likewise, you may also turn off/on Grid lines, turn on markers to show plotted points on the pen trace, etc.

Navigation Buttons

The Datalog database for the Temp Zones example includes 5 tags logged every second over a four hour period (approximately 240 minutes divided into about 480 ½ minute intervals). The ➔ navigation button scrolls the plot one interval to the right, the ➔➔ navigation button scrolls the plot two intervals to the right and a third Button provided takes you to the right end of the plot. Similarly, three buttons for navigation to the left are provided. You may also enter any Interval # and click 'Go To Interval', to scroll to that point in the database.

Other Profile Elements

Other profile elements include Graph Properties (such as Title Text attributes, Grid attributes, etc.) These graph properties can be accessed and changed by clicking on the 'Edit Properties' button.

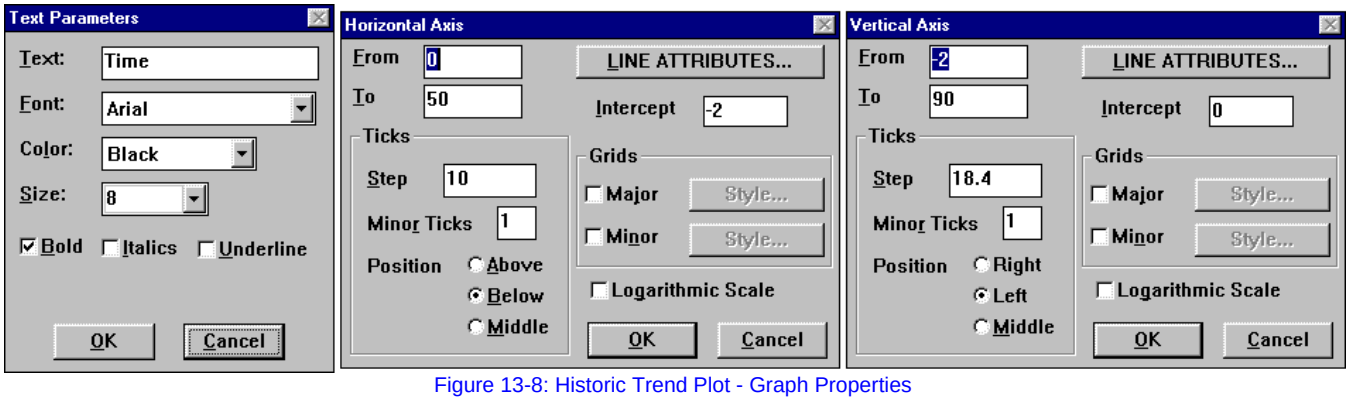


Figure 13-8: Historic Trend Plot - Graph Properties

Text Parameters for Main title, x-axis title, and y-axis title are changed either by double clicking on the title text itself or by clicking Edit Properties button (in the Graph Properties area).

Edit Profile

Click on the Edit Profile button to access the Profile Specification dialog.

Step 4. Print Trend Charts

In your trend history analysis if you have discovered interesting trend, click on 'File → Print' to obtain a trend chart printout for your records.

Note: If you do not wish to see a trace printed, you must de-select the corresponding tag in the (Datasets) Profile Specification, display the trend and then print.

14 User DLL

14.1 Introduction

InstantHMI User DLL is an integral part of the InstantHMI architecture. It is a Microsoft Windows dynamic link library (DLL) that you may write to extend the functionality of the runtime engine to meet your own special requirements. The InstantHMI architecture allows User DLL to exchange information with the InstantHMI runtime engine. Once written, your User DLL becomes an integral part of the InstantHMI runtime engine and enables access to runtime process information for analysis, or for monitoring and controlling systems external to the runtime process.

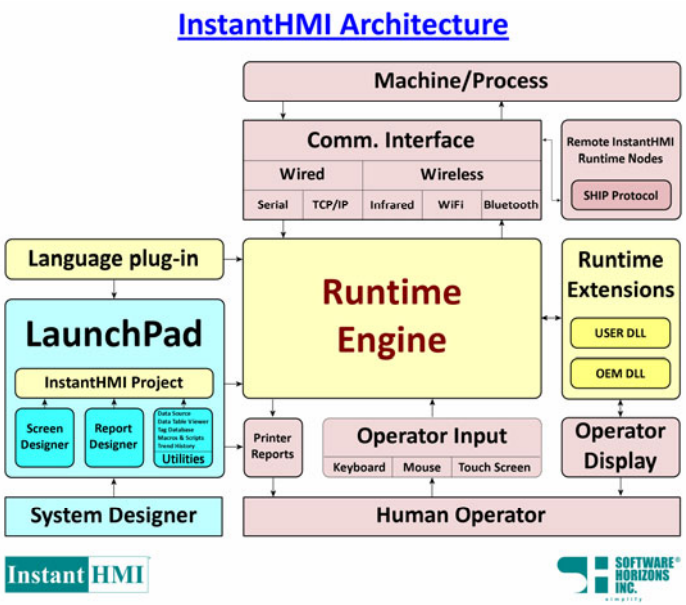


Figure 14-1: InstantHMI Architecture showing User DLL Functionality

14.2 Writing User DLL

The responsibility of writing a properly functioning User DLL is entirely yours. Writing a DLL is somewhat more complicated than conventional C/C++ programming. If you are an inexperienced DLL programmer you should consult references such as compiler documentation or the Microsoft Windows SDK "Guide To Programming", or books such as Charles Petzold's "Programming Windows". If you are unfamiliar or new to DLL writing we strongly recommend that you seek competent help. Software Horizons provides engineering services at a reasonable cost; you may choose this option and let us write your User DLL for you.

We provide a skeleton User DLL that may be modified by you. To modify the DLL use a Microsoft Windows compatible language compiler, preferably a C/C++ compiler such as the Microsoft Visual Studio 2008 or later.

Note: All InstantHMI (PC, PPC, CE) Applications are developed under Visual Studio 2008.

Compilers have standard make/project templates that you may use to build a Microsoft Windows compatible DLL. The make/project file performs the required programming steps of compilation and object module linking of the DLL. It is recommended that you use a standard compiler make file, to ensure that appropriate object modules, and windows libraries are linked to/from your DLL. There are no additional InstantHMI files or libraries required to build User DLL.

After writing your DLL you should copy it to the InstantHMI runtime project directory for PC runtime engines and to the InstantHMI installation directory for PDA/CE runtime engines. At startup, if the

User DLL option is enabled, the runtime program searches for the DLL named "IHMIUser.dll" and automatically loads it. **You must name your User DLL "IHMIUser.dll"**.

14.3 Skeleton User DLL

The source code of the Skeleton User DLL is shown below. It is a bare bones Microsoft Windows DLL with the single entry point, UserDllEntry. The file IHMIUser.cpp contains example code for UserDllEntry function (Figure 14-2). Examination of the included header file (Figure 14-3) shows that the above function is treated as a C function, not a C++ function. This single entry point (function) is called periodically by the runtime program. The **IHMIUserDllStruct** (Figure 14-4) structure is used to transfer information between the runtime engine and User DLL.

```
/*****************************************************************************
-----------------------------------------------------------------------------
                              DISCLAIMER
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warranty.  Software Horizons Inc. does not make any representation,
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by the programs contained here.  This includes, but is not limited
to, interruption of service, loss of data, loss of consulting or
anticipatory profits, or consequential damages from the use of these
programs.
-----------------------------------------------------------------------------
```

To modify the DLL, create your own (special) functions and place calls to them within the above function, UserDllEntry().

```
-----------------------------------------------------------------------------
                              IHMIUser.cpp

Copyright(c) 2000 - 2013 Software Horizons Inc.
*****************************************************************************/

#include <windows.h>
#include "UserDLL.h"        // Definition of IHMIUSER structure
#include "IHMIUser.h"       // Function definitions

    // User DLL Entry point
int UserDllEntry( IHMIUserDllStruct &UserInfo )
{
UserInfo.Command = USERCMD_NOCMD;
UserInfo.Status = USERSTAT_NOSTATUS;

return SUCCESS;
}
```

Figure 14-2: Skeleton User DLL

```
-----------------------------------------------------------------------------
                              IHMIUser.h
Copyright(c) 2000 - 2013 Software Horizons Inc.
*****************************************************************************/

#ifndef __IHMIUSER_H__
#define __IHMIUSER_H__

#ifdef __cplusplus
    extern "C" {
#endif  /* __cplusplus */
    //  Begin exported functions.
    int FAR UserDllEntry( IHMIUserDllStruct &UserInfo );
    //  End exported functions.
#ifdef __cplusplus
    }
#endif

#endif  //  __IHMIUSER_H__
```

Figure 14-3: Include File IHMIUser.h

```
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programs contained here.  This includes, but is not limited to, interruption of service, loss of
data, loss of consulting or anticipatory profits, or consequential damages from the use of these
programs.
-----------------------------------------------------------------------------------------------------
UserDll.h
Copyright(c) 2000 - 2013 Software Horizons Inc.
*****************************************************************************************************/

#ifndef __USERDLL_H__
#define __USERDLL_H__

#define     SUCCESS                 0

// Commands to be processed by Runtime
#define USERCMD_NOCMD                       0
#define USERCMD_READ                        1
#define USERCMD_WRITE                       2
#define USERCMD_SPOOL                       3

// Status Definitions of commands sent to Runtime
#define USERSTAT_NOSTATUS           0
#define USERSTAT_NOCMD_DONE                 1
#define USERSTAT_NOCMD_PENDING      2
#define USERSTAT_READ_DONE                  3
#define USERSTAT_READ_PENDING               4
#define USERSTAT_WRITE_DONE                 5
#define USERSTAT_WRITE_PENDING      6
#define USERSTAT_SPOOL_DONE                 7
#define USERSTAT_SPOOL_PENDING      8

// Error Codes if Command not successfully processed
#define USERERR_NOERR                       0
#define USERERR_CMDNOTSUPPORTED1

// Data Memory Types
#define REG_MEM                     1       // Register
#define BIT_MEM             2       // Bit
#define PTIMER_MEM                  3       // Preset Timer
#define CTIMER_MEM                  4       // Current Timer
#define LOCAL_MEM                   6       // Local
#define INPUT_MEM                   9       // Input
#define OUTPUT_MEM                  10      // Output
#define PCOUNTER_MEM                        11      // Preset Counter
#define CCOUNTER_MEM                        12      // Current Counter
#define BYTE_MEM                    17      // Byte
#define STRING_MEM                  18      // String

// Information passed between the Runtime and User DLL
#define IHMIUSERDLLSTRUCT_TAGNAME_SIZE              256
#define IHMIUSERDLLSTRUCT_DATASOURCENAME_SIZE   256
#define IHMIUSERDLLSTRUCT_DEVICENAME_SIZE                   256
#define IHMIUSERDLLSTRUCT_BUFFER_SIZE                       256

struct IHMIUserDllStruct
{
WORD        Status;             // Used to remember state User DLL was last left in so User DLL can pick up where
                    // it left off
```

```
    WORD        Command;            // See commands above
    WORD        Error;              // Used to pass error code between Runtime and User DLL
    WORD        bUseTagName;        // If true read/write operation based on Tag Name.  If false read/write operation
                // based on MemType, Address, BitNum, Station, DataSourceName, and DeviceName of
        // this structure
    DWORD       Address;  // Address to Read from or Write to
    WORD        BitNum;             // Bit number - Used in select drivers
    WORD        Station;    // Station number of device to communicate with. This will be added to the Station
        // Offset of the selected Data Source unless bUseDllStationOffset is true, in                    // which case
    Station will be used as Station Offset for the current Command
    WORD        MemoryType;         // See memory types above.  Check manual for additional use of memory types.
    WORD        NumBytes;           // Number of bytes to read/write
    WORD        bUseDllStationOffset; // Tells runtime to ignore data source station offset and use the "Station"
        // parameter of this structure to override the station offset
    WORD        bUseDllDeviceName;          // Tells runtime to ignore the data source device name and use the
                        // "DeviceName" parameter of this structure to override device name
    // Tag Name to use for read/write commands when bUseTagName is true
    TCHAR       TagName[IHMIUSERDLLSTRUCT_TAGNAME_SIZE];
    // Data source to use for communication
    TCHAR       DataSourceName[IHMIUSERDLLSTRUCT_DATASOURCENAME_SIZE];
    // Device Name from IP Manager for TCP/IP comms
    TCHAR       DeviceName[IHMIUSERDLLSTRUCT_DEVICENAME_SIZE];
    // Buffer to pass data back and forth between Runtime and User DLL.
    BYTE        Buffer[IHMIUSERDLLSTRUCT_BUFFER_SIZE];
    WORD        *pLocalMem;         // Pointer to LocalMemory array of runtime
    };

    #endif      // __USERDLL_H__
```

Figure 14-4: Include File UserDLL.h

14.4 Special Considerations

In general you can do anything in your modified version of IHMIUser.dll that you are allowed to do in any Microsoft Windows DLL. To simplify writing User DLL as an InstantHMI extension consider the following:

- If you must export functions, write them as "C" not "C++" functions. "C++" function names are mangled (decorated) and are much more difficult to export.
- Remember that your DLL must co-exist with the rest of the runtime engine and the responsibility for writing a well-behaved IHMIUser.dll is entirely yours. If your dll "hogs the CPU" you may degrade runtime program performance and even bring it to a grinding halt.
- The runtime calls the DLL periodically. You cannot depend on a specific calling frequency or fixed number of "time slices". The runtime engine tries to call the entry point constantly whenever no other program has messages in its input queue.

Note: Four application examples are described in Sections 14.5 - 14.8 to illustrate the power and flexibility of the User DLL extensibility built into the InstantHMI runtime architecture. Contact Software Horizons for a quote if you need a custom User DLL implementation.

Version 6.1.17 B4008 and later include a new User DLL export function to allow for long tag, data source, and device names (255 characters). There are also provisions to allow User DLL to override the data source station offset and device name. Runtime can work with both the old and new style User DLL. Runtime will check for new User DLL Entry function first and use this if discovered. If new User DLL Entry function is not discovered (but the old one is) the runtime will use the old entry function to support older User DLL that have not been updated to the new format.

14.5 Example 1: Read / Write PLC Data Using Tags

This example implementation of User DLL (Figure 1.4) illustrates how User DLL may interact with InstantHMI to read a tag value from a controller (using a existing InstantHMI tag). The tag value read will be compared against some alarm value. The result of this comparison will be transferred back to a bit tag in the controller via InstantHMI.

In summary,

1. InstantHMI accepts a single command from the User DLL and will return the result the next time the runtime calls the User DLL

2. By piggy-backing on the runtime engine with its driver, the User DLL communicates with the controller without any knowledge of the communication protocol.

3. The logic in User DLL becomes an extension of the controller logic without any need for modifying the controller logic. This feature is helpful in trying out modifications without changing the original controller logic

4. InstantHMI runtime serves as the bridge between any devices connected and known only to the User DLL and any devices connected and known only to InstantHMI (CommXX32.DLL).

```
/*****************************************************************************************************************
---------------------------------------------------------------------------------------------------------
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---------------------------------------------------------------------------------------------------------The software sample is provided on an "AS IS" basis, without warranty. Software Horizons Inc. does not make any representation, or warranty, either express or implied, with respect to the software programs, their quality, accuracy, or fitness for a specific purpose. Therefore, Software Horizons Inc. shall have no liability to you or any other person or entity with respect to any liability, loss, or damage caused or alleged to have been caused directly or indirectly by the programs contained here. This includes, but is not limited to, interruption of service, loss of data, loss of consulting or anticipatory profits, or consequential damages from the use of these programs.
---------------------------------------------------------------------------------------------------------IHMIUser.cpp
Copyright(c) 2000 - 2013 Software Horizons Inc.
*****************************************************************************************************************/
#include <windows.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "UserDLL.h"   // Definition of IHMIUSER structure
#include "IHMIUser.h"   // Function definitions

// User Definitions and Global Variables
#define NO_COMMAND                      0
#define READ_PLC                1
#define WRITE_PLC               2

#define ALARM_VALUE_TAG_NAME        _T("Alarm Value")
#define ALARM_STATUS_TAG_NAME       _T("Alarm Status")
#define ALARM_CONDITION                         100

static int      gStatus             = READ_PLC,
                gCallCount      = 0;

// User DLL Entry point
int UserDllEntry( IHMIUserDllStruct &UserInfo )
{
int  result = SUCCESS;

switch( gStatus )
    {
    case READ_PLC:
                // Request runtime to read a register from the PLC
                UserInfo.Command            = USERCMD_READ;         // Command to read
                UserInfo.Error                      = SUCCESS;
                UserInfo.Status                     = USERSTAT_NOSTATUS;
                UserInfo.bUseTagName                    = TRUE;
                _tcscpy( UserInfo.TagName, ALARM_VALUE_TAG_NAME );
```

```
                gStatus = WRITE_PLC;        // Change status to write bit on the next call
                result  = SUCCESS;
                break;

        case WRITE_PLC:
                // Request runtime to write a bit to the PLC
                if( UserInfo.error == SUCCESS )
                        {
                        // Register read was successful, if read value is in alarm state
                        // set Output 200, else reset output 200
                        UserInfo.Command            = USERCMD_WRITE;        // Command to write
                        UserInfo.Error                  = SUCCESS;
                        UserInfo.Status                 = USERSTAT_NOSTATUS;
                        UserInfo.bUseTagName                = TRUE;
                        _tcscpy( UserInfo.TagName, ALARM_STATUS_TAG_NAME );

                        // Check alarm condition
                        WORD regiserValue   = 0;
                        BYTE outputValue    = 0;

                        regiserValue = UserInfo.Buffer[1];
                        regiserValue <<= 8;
                        regiserValue |= UserInfo.Buffer[0];

                        if( registerValue > ALARM_CONDITION )           // In alarm condition?
                                outputValue = 1;    // Yes, set the output
                        else
                                outputValue = 0;    // No, reset the output

                        UserInfo.Buffer[0] = outputValue;
                        UserInfo.Buffer[1] = 0;

                        gStatus = NO_COMMAND;   // Switch to no command
                        result = SUCCESS;
                        }
                else
                        {
                        gStatus                         = NO_COMMAND;
                        UserInfo.Command = USERCMD_NOCMD;       // No Command for runtime
                        result                          = ~SUCCESS;             // FAIL
                        }
                break;

        default:    // No Command
                if( ++gCallCount > 10 )         // Issue command to runtime once every 10 calls
                        {
                        gCallCount      = 0;
                        gStatus                 = READ_PLC;
                        }

                UserInfo.Command = USERCMD_NOCMD;
                result = SUCCESS;
                break;
        }

    return result;
}
```

Figure 14-5: Example User DLL to Read / Write PLC Data Using Tags

14.6 Example 2: Read / Write PLC Data Without Tags

This example implementation of User DLL (Figure 1.4) illustrates how User DLL may interact with InstantHMI to read a register value from a PLC (using a InstantHMI Data Source). The register value read will be compared against some alarm value. The result of this comparison will be transferred back to a bit in the PLC via InstantHMI.

```
/*****************************************************************************************************
---------------------------------------------------------------------------------------------
DISCLAIMER
-----------------------------------------------------------------------------------------------The software
sample is provided on an "AS IS" basis, without warranty. Software Horizons Inc. does not
make any representation, or warranty, either express or implied, with respect to the software
programs, their quality, accuracy, or fitness for a specific purpose. Therefore, Software
Horizons Inc. shall have no liability to you or any other person or entity with respect to any
liability, loss, or damage caused or alleged to have been caused directly or indirectly by the
programs contained here. This includes, but is not limited to, interruption of service, loss of
data, loss of consulting or anticipatory profits, or consequential damages from the use of these
programs.
-----------------------------------------------------------------------------------------------IHMIUser.cpp
Copyright(c) 2000 - 2013 Software Horizons Inc.
*****************************************************************************************************/
#include <windows.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "UserDLL.h"   // Definition of IHMIUSER structure
#include "IHMIUser.h"   // Function definitions

// User Definitions and Global Variables
#define NO_COMMAND                      0
#define READ_PLC                1
#define WRITE_PLC               2
#define ALARM_CONDITION         100     // Defined for register 810
#define DATA_SOURCE_NAME  _T("My Data Source")

static int      gStatus             = READ_PLC,
                gCallCount      = 0;

// User DLL Entry point
int UserDllEntry( IHMIUserDllStruct &UserInfo )
{
int  result = SUCCESS;

switch( gStatus )
    {
    case READ_PLC:
                // Request runtime to read a register from the PLC
                UserInfo.Command = USERCMD_READ;        // Command to read
                UserInfo.Error          = SUCCESS;
                UserInfo.Status         = USERSTAT_NOSTATUS;
                UserInfo.bUseTagName        = FALSE;
                UserInfo.MemoryType         = REG_MEM;              // Register memory type
                UserInfo.Address    = 810;                  // Address 810
                UserInfo.Station    = 0;                    // Station 0
                UserInfo.NumBytes = 2;                      // Num Bytes to read
                _tcscpy( UserInfo.DataSourceName, DATA_SOURCE_NAME );

                gStatus = WRITE_PLC;        // Change status to write bit on the next call
                result   = SUCCESS;
                break;

    case WRITE_PLC:
```

```
                    // Request runtime to write a bit to the PLC
                    if( UserInfo.error == SUCCESS )
                              {
                              // Register read was successful, if read value is in alarm state
                              // set Output 200, else reset output 200
                              UserInfo.Command = USERCMD_WRITE;          // Command to write
                              UserInfo.Error           = SUCCESS;
                              UserInfo.Status          = USERSTAT_NOSTATUS;
                              UserInfo.bUseTagName     = FALSE;
                              UserInfo.MemoryType      = OUTPUT_MEM;          // Output memory type
                              UserInfo.Address    = 200;                      // Address 200
                              UserInfo.Station    = 0;                        // Station 0;
                              UserInfo.NumBytes = 1;                          // Num Bytes to write
                              _tcscpy( UserInfo.DataSourceName, DATA_SOURCE_NAME );

                              // Check alarm condition
                              WORD regiserValue  = 0;
                              BYTE outputValue    = 0;

                              regiserValue = UserInfo.Buffer[1];
                              regiserValue <<= 8;
                              regiserValue |= UserInfo.Buffer[0];

                              if( registerValue > ALARM_CONDITION )          // In alarm condition?
                                        outputValue = 1;    // Yes, set the output
                              else
                                        outputValue = 0;    // No, reset the output

                              UserInfo.Buffer[0] = outputValue;
                              UserInfo.Buffer[1] = 0;

                              gStatus = NO_COMMAND;    // Switch to no command
                              result = SUCCESS;
                              }
                    else
                              {
                              gStatus                        = NO_COMMAND;
                              UserInfo.Command = USERCMD_NOCMD;       // No Command for runtime
                              result                         = ~SUCCESS;          // FAIL
                              }
                    break;

          default:  // No Command
                    if( ++gCallCount > 10 )        // Issue command to runtime once every 10 calls
                              {
                              gCallCount     = 0;
                              gStatus                = READ_PLC;
                              }

                    UserInfo.Command = USERCMD_NOCMD;
                    result = SUCCESS;
                    break;
          }

     return result;
}
```

Figure 14-6: Example User DLL to Read / Write PLC Data Without Tags

14.7 Example 3:Time Triggered Spooling

14.7.1 Introduction

Described here is a User DLL allowing you to specify a time to trigger different spooling actions. The spooling actions can be done upon single or multiple spool files. **Note:** The source code is not included here. Contact Software Horizons for implementation of this and other User DLL to suit your application requirements. We will gladly quote for your User DLL application development.

14.7.2 Use of Time Triggered User DLL

Make sure your installation supports User DLL option and the correct IHMIUser.dll file is in the project directory. Add to the [USERDLL] section in IHMI-6.INI file in Windows directory :

```
[USERDLL]
FIRST_SPOOL=1                ;must be greater than 0.
LAST_SPOOL=1                 ;must be greater than or equal to FIRST_SPOOL
TRIGGER_HOUR=0               ;0 - 23.
TRIGGER_MINUTE=0             ;0 - 59.
TRIGGER_SECOND=0             ;Reserved for future use
SPOOL_ACTION=3328            ;Spool function from Section 6.3.3
LOCAL_START_ADDRESS=1        ;Must be greater than 0
```

The parameters FIRST_SPOOL and LAST_SPOOL refer to the first and last spool control files XX.SPL when the SPOOL_ACTION is spool individual or spool aggregate. If the SPOOL_ACTION is other than spool individual or spool aggregate the FIRST_SPOOL and LAST_SPOOL parameters refer to spooled data files SPOOL.SXX.

The spooling action (SPOOL_ACTION) will be initiated at the trigger time (TRIGGER_HOUR and TRIGGER_MINUTE). The spool action can be any of the actions described in Section 5.3.3. The first six parameters listed in [USERDLL] section of IHMI-6.INI (see above) will be stored at run time in six consecutive local memory locations starting at address LOCAL_START_ADDRESS. For example if LOCAL_START_ADDRESS = 1 then the FIRST_SPOOL parameter will be stored in local memory address 1, LAST_SPOOL parameter will be stored in local memory address 2, TRIGGER_HOUR will be stored in local memory address 3, TRIGGER_MINUTE will be stored in local memory address 4, TRIGGER_SECOND will be stored in local memory address 5, and SPOOL_ACTION will be stored in local memory address 6. By placing these parameters in local memory the operator has the flexibility to change any of these parameters at runtime if so desired.

Example 2A: Spool Individual
To have InstantHMI execute the Spool Individual function using spool control files 10.SPL - 20.SPL daily at 12:00 noon the [USERDLL] section of your IHMI-6.INI should contain the following:

```
[USERDLL]
FIRST_SPOOL=10
LAST_SPOOL=20
TRIGGER_HOUR=12
TRIGGER_MINUTE=0
TRIGGER_SECOND=0
SPOOL_ACTION=0
LOCAL_START_ADDRESS=1
```

Example 2B: Spool Delete
To have InstantHMI execute the Spool Delete function for spool data files SPOOL.S01 - SPOOL.S05 daily at 5:30pm the [USERDLL] section of your IHMI-6.INI should contain the following:

```
[USERDLL]
FIRST_SPOOL=1
LAST_SPOOL=5
TRIGGER_HOUR=17
TRIGGER_MINUTE=30
TRIGGER_SECOND=0
SPOOL_ACTION=256
LOCAL_START_ADDRESS=1
```

Example 2C: Archive Minutes
To have InstantHMI execute the Archive Minutes function for spool data files SPOOL.S23 - SPOOL.S33 daily at 6:45am the [USERDLL] section of your IHMI-6.INI should contain the following:

```
[USERDLL]
FIRST_SPOOL=23
LAST_SPOOL=33
TRIGGER_HOUR=6
TRIGGER_MINUTE=45
TRIGGER_SECOND=0
SPOOL_ACTION=2816
LOCAL_START_ADDRESS=1
```

Example 2D: Save Hours
To have InstantHMI execute the save hours function for spool data files SPOOL.S01 - SPOOL.S15 daily at 12:00pm the [USERDLL] section of your IHMI-6.INI should contain the following:

```
[USERDLL]
FIRST_SPOOL=1
LAST_SPOOL=15
TRIGGER_HOUR=12
TRIGGER_MINUTE=0
TRIGGER_SECOND=0
SPOOL_ACTION=5632
LOCAL_START_ADDRESS=1
```

14.8 Example 4:Time-Triggered Control

14.8.1 Introduction

This User DLL allows you to specify On time and an Off time. At these times a value will be written to the controller. This action can be done upon multiple controllers on a network. **Note:** The source code is not included here. Contact Software Horizons Inc. for implementation of this and other User DLL to suit your application requirements. We will gladly provide a quote for your User DLL application development.
Use of User DLL

14.8.2 Use of User DLL

Step 1: Make sure the following lines are included in IHMI-6.INI file in your Windows directory:

```
[USERDLL]
REGISTER=717
        ;Address of register to be written to
FIRST_STATION=1
;Can not = 0.
LAST_STATION=1
        ;Can not = 0.
ON_HOUR=0
        ;0 - 23.
ON_MINUTE=0
        ;0 - 59.
ON_VALUE=1
        ;Value to be written at specified address at on time.
OFF_HOUR=0
        ;0 - 23.
OFF_MINUTE=0
        ;0 - 59.
OFF_VALUE=0
        ;Value to be written at specified address at off time.
SKIP_SATURDAYS=YES
        ;YES = Do not write values to the controller on Saturdays.
        ;NO = Continue to write values to the controller on Saturdays.
SKIP_SUNDAYS=YES
        ;YES = Do not write values to the controller on Sundays.
        ;NO = Continue to write values to the controller on Sundays.
NUMBER_OF_EXCEPTIONS=1;
        ;Number of days to skip writing values to controller.
SKIP1=09/08/97;
        ;Date to skip writing values to controller.
        ;Date must be of format MM/DD/YY
        ;where MM, DD, and YY are all two digit numbers
```

The FIRST_STATION and LAST_STATION parameters refer to the first and last station number the ON_VALUE and OFF_VALUE should be written to. To write the value to only one specific station number you would set the FIRST_STATION = station number, LAST_STATION = station number (= FIRST_STATION).

The ON_HOUR and ON_MINUTE refer to the hour and minute that trigger the writing of the ON_VALUE the specified controllers. The OFF_HOUR and OFF_MINUTE refer to the hour and minute that trigger the writing of the OFF_VALUE to the specified controllers.

The SKIP_SATURDAYS and SKIP_SUNDAYS parameters allow you to disable the time triggering action User DLL on Saturdays and Sundays.

The NUMBER_OF_EXCEPTIONS parameter allows you to specify the number of other days (such as holidays) you would like to disable the time triggering. To specify the dates the time triggering is to be disabled use the parameters SKIP1, SKIP2, SKIP3, etc.. These SKIP# parameters have the format of MM/DD/YY where MM is the two digit month, DD is the two digit day, and YY is the last two digits of the year.

Step 2: The appropriate DLL file IHMIUser.dll should be in the InstantHMI project directory.

Step 3: Make sure your controller is connected properly and communicates with InstantHMI.

Step 4: Verify that the time triggering occurs as expected and the controllers 1 and 2 turn On and Off as desired.

14.8.3 Application to Watlow Controllers

This example will illustrate the parameter setup in the above User DLL to set Output 2 on the Watlow 96 Controller (= address 717) to heat at 3:00am and to turn off at 7:00pm for controller stations 1 and 2. It will also disable the time trigger control on Sundays, December 25, 1997 and July 4, 1998.

The [USERDLL] section in the IHMI-6.INI contains the following:

```
[USERDLL]
REGISTER=717
FIRST_STATION=1
LAST_STATION=2
ON_HOUR=3
ON_MINUTE=0
ON_VALUE=1
OFF_HOUR=19
OFF_MINUTE=0
OFF_VALUE=0
SKIP_SATURDAYS=NO
SKIP_SUNDAYS=YES
NUMBER_OF_EXCEPTIONS=2
SKIP1=12/25/97
SKIP2=07/04/98
```

14.9 Example 5:Commercial Laundry Controller

14.9.1 Introduction

This user DLL involves a specific implementation using ACS Controllers (an OEM manufacturer) in a Commercial Laundry application.

14.9.2 Laundry Application Time Line of Activity

Step 1: Operator loads Washer.

Step 2: Operator enters Product Code into ACS Controller

Step 3: Operator pushes Start button on the Washer.

Step 4: User DLL detects Start button press and loads the wash formula of the entered Product Code into the Washer.

Step 5: Washer is sequenced by ACS Controller as per loaded formula. User DLL monitors the status of ACS Controllers and PLCs.

Step 6: Washer finishes the load.

Step 7: When Washer is finished with load, User DLL signals the Shuttle to pick up the load.

Step 8: User DLL signals Washer to unload onto the Shuttle and transfers the Product Code to the Shuttle.

Step 9: When a dryer becomes free User DLL signals the Shuttle to move to the free Dryer, unloads the Shuttle into the Dryer, and transfers the Product Code and corresponding Dry formula to the Dryer.

Step 10: User DLL monitors Dryer controller.

Step 11: When drying is complete User DLL signals the dryer to unload onto the conveyor.

14.9.3 User DLL Overview

This implementation of IHMIUser.dll has two functions: (i) allow for creating and editing of Product, Wash and Dry formulas, (ii) automate the washing and drying process and serve as a “traffic cop” to

oversee the transfer of product among the Washers, Dryers, Shuttle and conveyor. (See Section 14.9.2 for a Time Line of Activity in the Laundry application).

The IHMIUser.dll allows for the creation of 9,999 product formulas, 255 wash formulas with 99 steps per formula, and 255 dry formulas. All of these formulas are saved to disk and are loaded when InstantHMI is started. All formulas may also be printed. The following should be in the [USERDLL] section of the IHMI-6.INI file located in the Windows directory.

```
[USERDLL]
OutputStr1=Cold Water
OutputStr2=Hot Water
…
OutputStr32=Steam
```

The strings listed above are used in printing of the wash formulas. OutputStr1 will correspond with Output 1 of the wash controller, OutputStr2 will correspond with Output 2 of the wash controller, etc..

The automation portion of the IHMIUser.dll is setup to run with four washers (extensible to maximum of 9), 3 dryers (extensible to a maximum of 9), 1 shuttle, and 1 conveyor and requires the following parameters to be setup in the [USERDLL] section of the IHMI-6.INI file in the Windows directory.

```
[USERDLL]
ACS_DATASOURCE=ACS
PLC_DATASOURCE=PLC
FIRST_WASH_STATION=4
LAST_WASH_STATION=9
FIRST_DRY_STATION=1
LAST_DRY_STATION=3
SHUTTLE_STATION=10
CONVEYOR_STATION=11
SHUTTLE_PARK_LOCATION=15
WASH_LOCATION1=1
WASH_LOCATION2=2
…
WASH_LOCATION9=9
DRY_LOCATION1=21
DRY_LOCATION2=22
…
DRY_LOCATION9=29
```

For each washer there is an ACS wash controller and a PLC. Also for each dryer there is an ACS dry controller and a PLC. There is also one PLC to control the shuttle and one PLC to control the conveyor. The ACS_DATASOURCE determines the communication port the ACS wash and dry controllers are connected to, and the PLC_DATASOURCE determines the port the PLCs are connected to. The FIRST_WASH_STATION and LAST_WASH_STATION notifies the User DLL of how many washers there are and the station numbers that correspond to them. The station numbers of the washers must be in consecutive order. If there is only one washer set the FIRST_WASH_STATION and LAST_WASH_STATION to the same station number. The FIRST_DRY_STATION and LAST_DRY_STATION parameters are similar to the FIRST_WASH_STATION and LAST_WASH_STATION parameters described above. The SHUTTLE_STATION parameter specifies the station number of the shuttle's PLC and the CONVEYOR_STATION parameter specifies the station number of the conveyor's PLC.

Each washer and dryer is assigned a unique number that specifies that machine's location. The parameters WASH_LOCATION1-9 specify the location of each washer and the parameters DRY_LOCATION1-9 specify the location of each dryer. The SHUTTLE_PARK_LOCATION specifies a location that the shuttle should go to while it is waiting to be either loaded or unloaded.

The User DLL has a single entry point, called UserEntry(), which is located in the file IHMIUser.cpp. This is the starting point for all actions that will take place. A global variable called State has been

declared to maintain the overall state of the User DLL. The four states include initialize, read, pause/idle, and run. The state initialize reads some required variables from the IHMI-6.INI file contained in the Windows directory and loads the Product Code assignments and Wash and Dry formulas into memory. This state is entered only at the start of the program.

The read state reads the runtime local memory addresses that contain the states of the Washers, Dryers, Shuttle, and the Conveyor. The read state also reads the status of the Product Assignment, Wash Formula, and Dry Formula editors and the status for the Product Assignment Reviewer and Wash Formula Reviewer. The source file for these actions is ACSREAD.CPP. The pause / idle state is entered via local memory address 500. If the value two is entered into this memory location all editing of Product Assignments and Formulas will be halted. All automation done by the running state will also be halted until local memory address 500 is reset.

The running state sequences all of the automation (from unloading the Washers to unloading the Dryers). The run state sequencing is done in the file named ACSRUN.CPP.

The shuttle automation is sequenced by an ownership concept. This concept only allows the washers or dryers to move if that washer or dryer is the “owner” of the shuttle. Moving the shuttle to the park location does not require ownership. The conveyor automation is also sequenced by an ownership concept. Only the dryer that owns the conveyor may unload its contents on to the conveyor belt.

14.9.4 User DLL Project File Descriptions

USERACS.VCPROJ – Contain project settings to build the project with the Microsoft Studio 2008 Compiler.

IHMIUSER.CPP, IHMIUSER.H – Contains the single entry point into the User DLL. This entry point is the exported function UserEntry(). This file also contains code to read initialization variables from the IHMI-6.INI file located in the Windows directory and to initialize the Product assignments and Wash and Dry formulas.

ACSREAD.CPP, ACSREAD.H – Contains the code to read the status of all Washers, all Dryers, Shuttle, Conveyor. Also contains code to read the status of the Product Assignment editor, Wash formula editor, and Dry formula editor for creating, editing, deleting, and loading assignments and formulas. Contains code for reading the status of the Product Assignment Reviewer and Wash Formula Reviewer.

ACSFORM.CPP, ACSFORM.H – Contains the class information and member functions for managing the Product assignments and Wash and Dry formulas.

ACSRUN.CPP, ACSRUN.H – Contains the code to cycle through the status of all Washers, all Dryers, Shuttle, and the Conveyor. Also contains code to control the shuttle under certain conditions and for downloading Product Assignments.

ACSWASH.CPP, ACSWASH.H – Contains the code for automating the Washers. Performs formula downloading, Washer unloading, and moving shuttle to Washer.

ACSDRY.CPP, ACSDRY.H – Contains the code for automating the Dryers. Calls for the shuttle when shuttle is loaded and dryer is empty, unloads the shuttle into the dryer, download product assignment and the Dry formula. Also unloads the dryer onto the conveyor if conveyor is empty.

ACSUTILS.CPP, ACSUTILS.H – Contains general purpose functions.

PRINTSTR.CPP, PRINTSTR.H –Code for printing the Product Assignments and Wash and Dry formulas.
ACSDEFS.H – Definition file for states and structures.

USERDLL.H – Contains the structure that is passed between the Runtime and the User DLL.

IHMIUSER.DEF – Definition file for the project.

14.9.5 User DLL Classes

CProductMgr – Array of pointers to CProductFormula objects.

CProductFormula – Contains the Product Code, Wash and Dry Formula ID's, Category, and Description for that Product Code. Also contains the number of steps in the Wash Formula.

CWashFormula – Contains its formula ID, Description, and number of steps in the formula. Contains an array of pointers of CWashStep objects that contain the specifics of each wash step.

CWashStep – Contains the specific information about the step.

CDryFormula – Contains the specifics of a Dry formula.

CWashLoad – Contains information for Washer automation.

CDryLoad – Contains information for automation of Dryers.

14.9.6 Remarks

The InstantHMI architecture (with extensibility afforded by its User DLL and OEM DLL) allows you to apply InstantHMI to any conceivable applications. Bring us your Application challenge and we will provide you with a cost-effective solution!

15 Quick Start Guide - Training Objectives

15.1 Introduction

We will get you up and running with InstantHMI and your controller on 'Day One'.

Have you installed InstantHMI? If not, do so now (see Appendix A in the InstantHMI manual). Run the InstantHMI LaunchPad. You will see the LaunchPad with four Projects in the pull-down list: Demo, MyProject, 'Quick Start PC', and Sample Project. You will also see a Thumbnail view of all the screens included in the selected project (Demo).

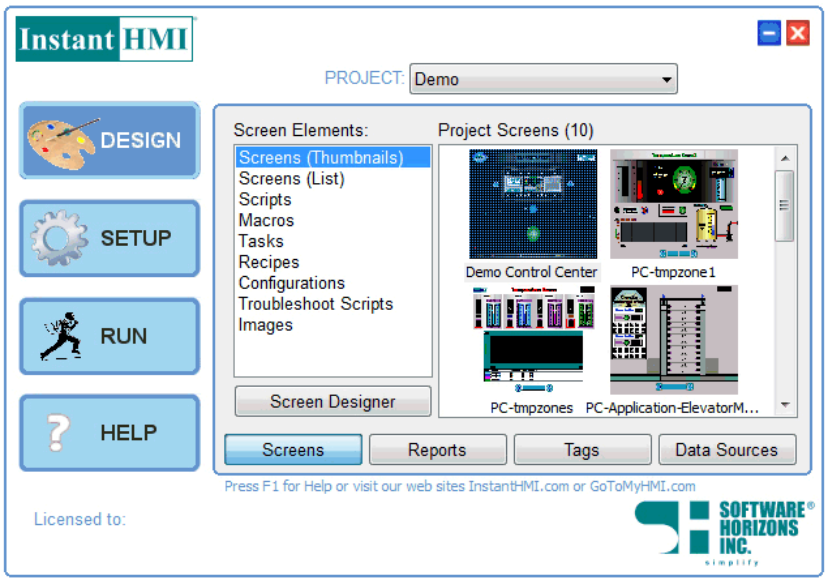

Figure 15-1: LaunchPad Showing 'Demo' Project Selected

Project	Screens*	Tags	Remarks
Demo	17	256	Includes various InstantHMI features that you can learn from.
MyProject	1	2	A minimal stub project, Template to start your own project.
Sample Project	3	18	Similar to MyProject, enhanced Template to start your own project.
Quick Start - PC	2 (+4)	20	A 'Water Supply System' application used as a training tool.
Template	0	16	Hidden project used as new project template by 'default'.

* In addition, a Watch list screen (provided automatically) may be enabled by you as a runtime option.

The **Demo** project includes various InstantHMI features that you can learn from. We suggest you run the Demo project (that is, in LaunchPad select 'Demo' in the Project pull-down list and then click RUN) and do a quick 2-minute review first. This will provide you with a quick overview of InstantHMI features that you can benefit from. You may re-visit any screen, script etc. in the Demo project at a later time for a detailed study. When you create a new project, the 'Template' folder is used as the project template by 'default'. You may use **MyProject**, a minimal stub project with a simple screen and 2 (controller) tags, as a template for your initial PLC communication testing. For your convenience, **Sample Project** provides the same controller tag functionality as in MyProject but with enhancements (scaled tag values, system date and time tags, and a runtime script simulating a simple 'Tank Level Control' application). You may use this 'Sample Project' as a learning tool and as a template for your own project. (Of course, the runtime script 'Runtime.sct' in 'Sample Project' should be eliminated or replaced with logic to suit your application). We shall use the '**Quick Start - PC**' project (simulating a Water Supply SCADA System) in this Quick Start Guide as a training tool.

15.2 Test Communications with Your PLC

15.2.1 Step 1: Create New Project

Run the InstantHMI LaunchPad. In LaunchPad use the Project pull-down list and select <New Project> or click on Setup → Project → New Project to access the **New Project Wizard**. The wizard will guide you through the steps in creating and testing a new project. Click on Help button for a quick review of 'Step 1: Create New Project'. When ready, click on 'Create New Project' button. This will display the 'New Project Definition' dialog.

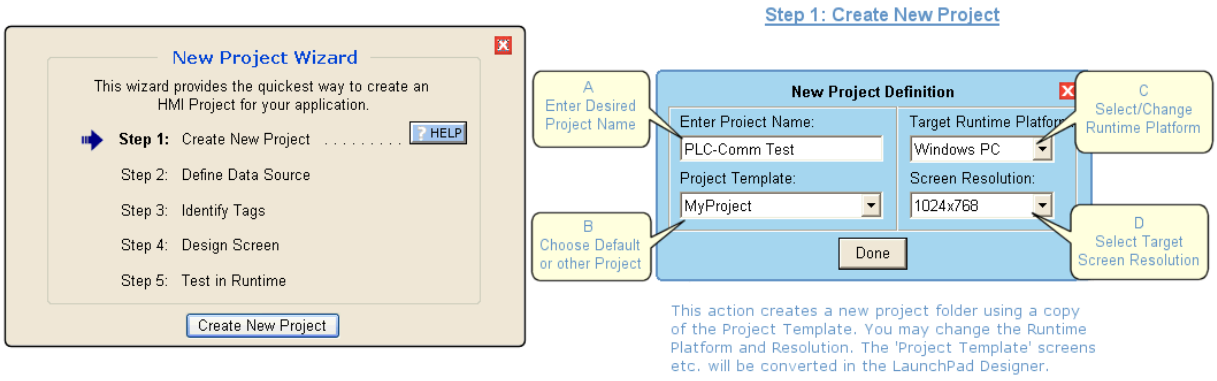
New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Create New Project
HELP
Step 2: Define Data Source
Step 3: Identify Tags
Step 4: Design Screen
Step 5: Test in Runtime
Create New Project
Step 1: Create New Project
A Enter Desired Project Name
New Project Definition
Enter Proiect Name:
PLC-Comm Test
Target Runtime Platfor
Windows PC
Project Template:
MyProject
Screen Resolution:
1024x768
C Select/Change Runtime Platform
B Choose Default or other Project
D Select Target Screen Resolution
Done
This action creates a new project folder using a copy of the Project Template. You may change the Runtime Platform and Resolution. The 'Project Template' screens etc. will be converted in the LaunchPad Designer.

Figure 15-2: New Project Wizard - Step1: Create New Project 'PLC-Comm Test'

A. Enter the desired project name (PLC-CommTest, or some other name)
B. Choose <MyProject> as Project Template to create a new project folder
C. Accept Runtime Platform inherited from the project template or change the Target Runtime Platform (Windows PC/CE/Mobile, Pocket PC, or Smart Phone) using the pull-down list.
D. Accept the Screen Resolution inherited from the project template or change it to one of the available Screen Resolutions for your new project.

Click on Done button to proceed with the new project creation. The New Project Wizard will take you to the next step. Note: We will use the stub project 'MyProject' (with its simple screen and two tags) for PLC communication testing purposes using the Runtime Engine (on the Windows PC platform). The tags (variables of interest) in the project pre-created for you are tabulated below.

Tag Name	Memory Type	Data Type	Address	Bit
Register 100	Local	Int16	100	100
Bit 101	Local	Bit	0	101

15.2.2 Step 2: Define Data Source

You need to define a Data Source for accessing the Memory locations for the tags in your PLC. Make sure your PLC is connected to the PC running InstantHMI.

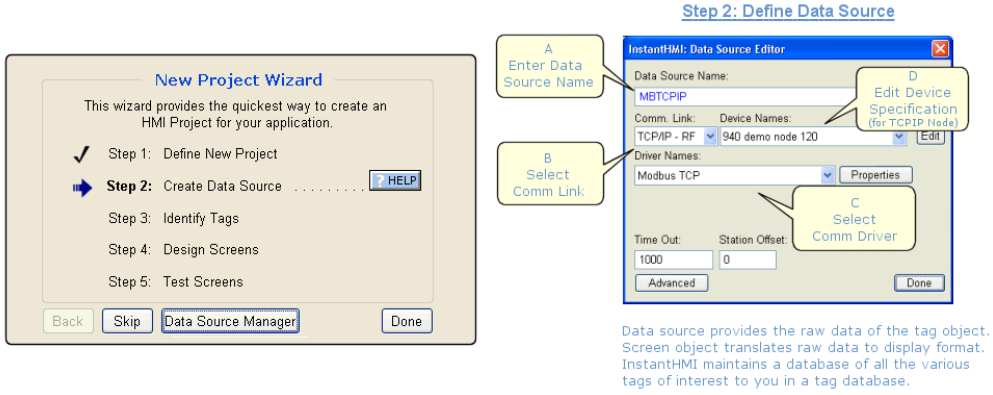
New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Define New Project
Step 2: Create Data Source
HELP
Step 3: Identify Tags
Step 4: Design Screens
Step 5: Test Screens
Back
Skip
Data Source Manager
Done
Step 2: Define Data Source
A Enter Data Source Name
B Select Comm Link
InstantHMI: Data Source Editor
Data Source Name:
MBTCPIP
D Edit Device Specification (for TCPIP Node)
Comm. Link:
Device Names:
TCP/IP - RF
940 demo node 120
Edit
Driver Names:
Modbus TCP
Properties
C Select Comm Driver
Time Out:
Station Offset:
1000
0
Advanced
Done
Data source provides the raw data of the tag object. Screen object translates raw data to display format. InstantHMI maintains a database of all the various tags of interest to you in a tag database.

Figure 15-3: New Project Wizard - Step2: Define Data Source

Click on Help button for a quick review of 'Step 2: Define Data Source'. When ready, click on 'Data Source Manager' button.

A. Enter the new Data Source name (MBTCPIP, in our example)
B. Select Comm Link (TCP/IP-RF in our example)
C. Select Communication Driver (Modbus TCP, in our example)
D. Edit device specification (name, IP address, etc.) for TCP/IP nodes

15.2.3 Step 3: Identify Tags

Click on Help button for a quick review of 'Step 3: Identify Tags'. When ready, click on 'Identify Tags' button to access the Data Viewer tool, which allows you to define data blocks, identify the tags of interest in the controller and then save them to the tag database.

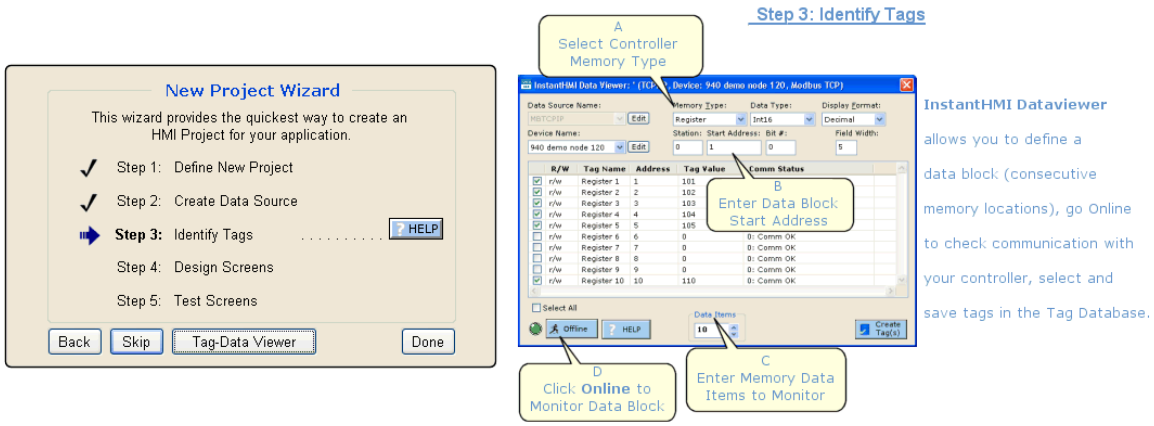
New Project Wizard
This wizard provides the quickest way to create an HMI Project for your application.
Step 1: Define New Project
Step 2: Create Data Source
Step 3: Identify Tags
HELP
Step 4: Design Screens
Step 5: Test Screens
Back
Skip
Tag-Data Viewer
Done
Step 3: Identify Tags
A
Select Controller Memory Type
B
Enter Data Block Start Address
C
Enter Memory Data Items to Monitor
D
Click Online to Monitor Data Block
InstantHMI Dataviewer
allows you to define a data block (consecutive memory locations), go Online to check communication with your controller, select and save tags in the Tag Database.

Figure 15-4: New Project Wizard - Step3: Identify Tags

Create Register memory tags as follows:

A. Select the controller memory type ('Register')
B. Enter the data block start address ('100')
C. Enter the number of data items ('1') to monitor in the Data Viewer
D. Click 'Online' button and let the Data Viewer tool retrieve and display the memory data values

Check 'Select All' and then click on 'Create Tags' to save the Register tag(s) to tag database. This will replace the previously defined tag Register 100 with your definition.

Create Bit memory tags as follows:

A. Select the controller memory type ('Bit')
B. Enter the data block start address ('101')
C. Enter the number of data items ('1') to monitor in the Data Viewer
D. Click 'Online' button and let the Data Viewer tool retrieve and display the memory data values

Check 'Select All' and then click on 'Create Tags' to save the Register tag(s) to tag database. This will replace the previously defined tag Bit 101 with your definition.

15.2.4 Step 4: Design Screen

Click on ' Screen Designer' button to access the Screen Designer, which allows you to create widgets and other data blocks on the screen, tie them to controller tags.

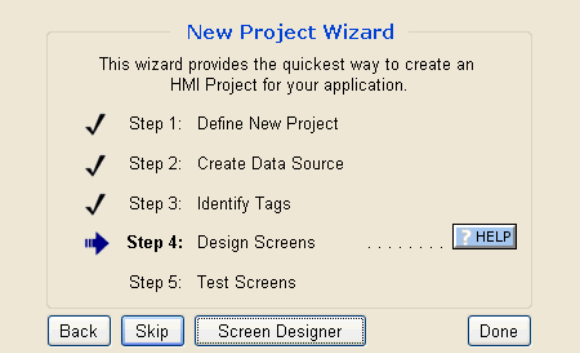

Figure 15-5: New Project Wizard - Step4: Design Screen

For now click on 'Skip' to skip Step 4 since we have included a Test screen for you (The two tags from Step 3 were used to replace the two tags tied to screen objects on Test Screen). You will use the Screen Designer extensively as part of the training in Section 2.

15.2.5 Step 5: Test Screen in Runtime

Click on 'Runtime Engine' button, which allows you to test the screen objects tied to controller tags.

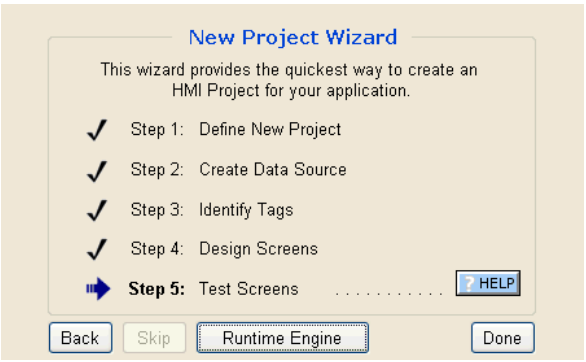

Figure 15-6: New Project Wizard - Step5: Test Screens in Runtime

In addition to the Test Screen provided, InstantHMI creates a Watch List screen automatically for you. This screen includes all project tags in a watch list as shown below. Note: To switch from Test screen to watch list screen, right click on (an empty area of) the screen and then click Screen → Next. After reviewing the test screen and confirming PLC communications exit the InstantHMI Runtime Engine.

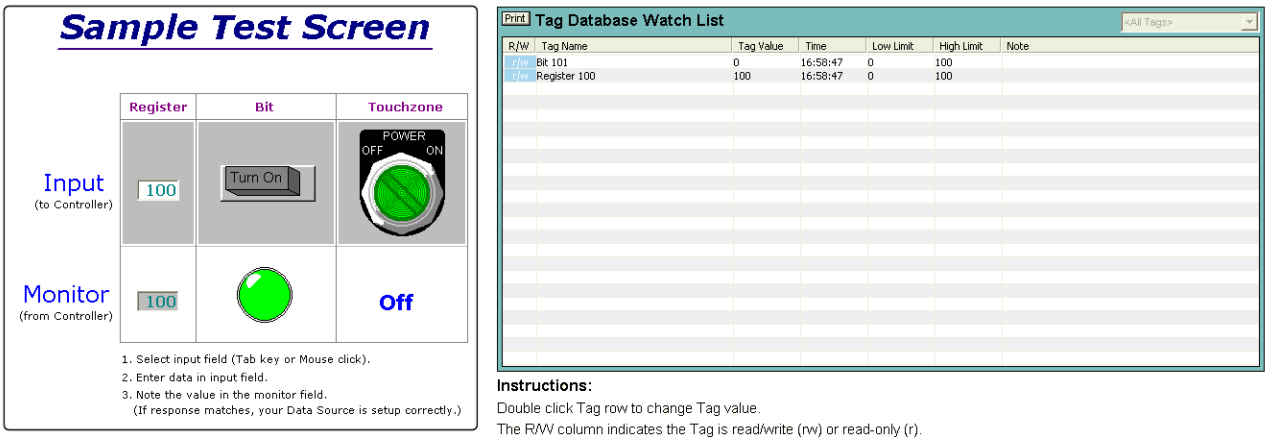

Figure 15-7: MyProject - Test Screen and Watch List Screen

15.3 Sample Application: Water Supply System

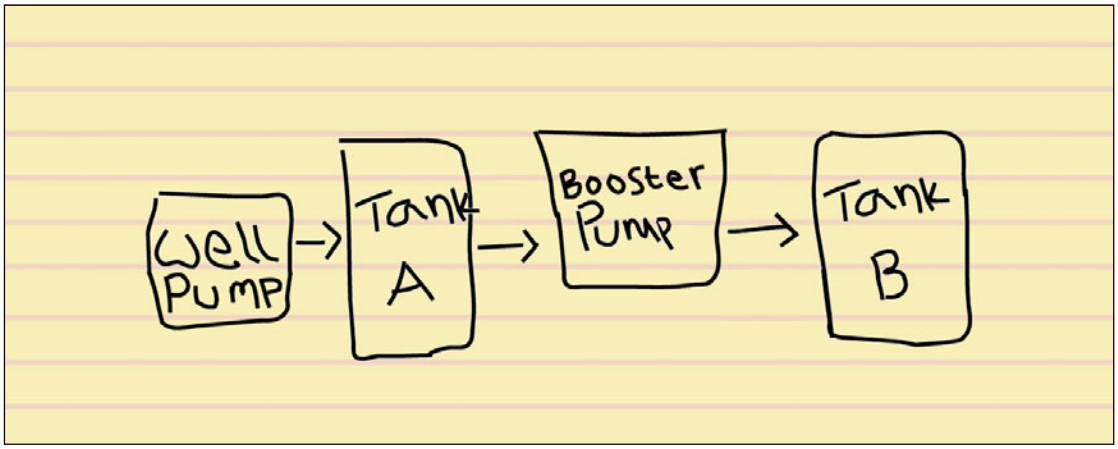

Figure 15-8: Water Supply System

The Water Supply System for a small community consists of two Tanks A & B, a Well Pump, and a Booster Pump station monitored and controlled from a central facility. Tank A supplies water to community members living in its vicinity. Tank A draws its water from the Well by initiating a 'Required' command to the Well (Pump). Tank B supplies water to community members living in its vicinity. Tank B draws its water from Tank A by initiating a 'Required' command to the Booster Pump. Manual overrides are required at the central facility to operate Well Pump and Booster Pump. All Remote sites are connected to the host central site's PLC via radio RTUs. The variables of interest (tabulated below) are maintained and the site logic is programmed in the PLC.

Site Name	RTU Number	Variables of Interest
Well Pump	1	Well (Pump) status and control Equipment alarms
Tank A	2	Tank A status and alarms Booster Pump status and control
Booster Pump	3	Tank A level
Tank B	4	Tank B status and alarms

Our task is to provide a Human Machine Interface for the operator(s) in the Water Supply System facility. InstantHMI can provide such an interface on multiple platforms. The HMI solutions on these platforms are very similar. We elaborate the PC platform for illustrative purposes (Section 15.4).

The central site PLC controller may be from different vendors. This Quick Start guide illustrates the solution for the sample application using a Simulation of any PLC controller implementation (Sections 15.4, 15.5, 15.6). The solution is specialized to various controllers from different manufacturers such as Allen-Bradley, Modicon, Koyo, etc. in Appendix A.

15.4 InstantHMI Solution: Water Supply System (PC)

To build the HMI/SCADA solution for the Water Supply System, we follow the Steps in the InstantHMI Solution Approach (Section 9.2) recapped here:

InstantHMI Solution Approach

Game Plan
Visualize your application in terms of one or more screens. The display data objects on the screens (to assist the Operator in the task of monitoring and control) will be based on the data sources available for the raw data to be presented in useful forms.

Step 1. Create New Project: Click on the LaunchPad → Setup → New Project. The New Project Wizard guides you through Steps 1 - 5.

Step 2. Define Data Source: Use Data Source Manager. Be sure the "Driver Name" parameter in Data Source matches your PLC driver (Appendix A).

Step 3. Identify Tags: Use Data Viewer to rapidly create and test the Tag Database for your application.

Design and Test Screens
Build your screen in stages. To start, skip Step4-Project Enhancements (4A- 4C), and get a simple screen working, and then include Step 4A and/or Step 4B and/or Step 4C in the next iteration stage. It is important that you check out communication with your PLC before investing your time on elaborate screens.

For each individual screen, repeat Steps 4 and 5, and proceed to complete your project.

Step 4. Design Screens: Use InstantHMI Screen Designer (Widget Palette and Object Assemblies) to create and test the preliminary screens for your application.

Step 4A-4C. Project Enhancements: (Do these after designing functional screens)
4A. Reports: Use Report Designer to create all the printer report and spool record templates.

4B. Customization: Use the Macro Editor, Script Editor, and Data Source Manager to set up macro commands, scripts, and remote data sources to enhance operator convenience.

4C. Special Registers: Make any additions needed to your ladder logic in PLC to implement the special registers defined in your InstantHMI project setup to enable event driven printer reports, spool reports, etc.

Step 5. Test Screens: Click on the Run Project button on the LaunchPad or double click on the Runtime Engine icon. Test your application screens.

Game Plan

Our sample application (Fresh Water Supply System, Figure 15-8) can be adequately presented to the operator using a '**System Status'** Screen**.** In the rest of this Section, we describe how to design such a screen in InstantHMI Screen Designer to display Tank Levels, Alarm States, etc. and allow for operator override of the automated requests for Pump actions. An additional '**Tank Level Trend'** Screen to show the real time trend of the tank water levels may also be very useful.

As recommended in the 'InstantHMI Solution Approach' above, our solution will be built in orderly incremental stages. Section 15.4.1 starts with the basic Stage 1, while Sections 15.4.2 – 15.4.5 cover more advanced stages 2-5. The discussion here (Section 2) applies to InstantHMI Runtime Engine on a PC platform. Section 15.5 covers the solution for a PPC (Pocket PC or Windows Mobile) runtime platform, while Section 15.6 covers the CE (Windows CE and CE.NET) runtime platform.

Please note that you must have the LaunchPad Designer installed and activated on your PC. In addition, the proper Runtime Engine must be installed and activated on the target platform. Registration and Activation (Appendix A in the InstantHMI manual) of your InstantHMI software installation is required to be able to design your screens and communicate with your controller.

15.4.1 System Status - Stage 1 (PC)

We now describe Steps 1 - 5 of the InstantHMI Solution Approach for developing the Human Machine Interface for the Water Supply System. These Steps are exactly the same as discussed earlier (Test Communications with Your PLC, Section 15.2).

Step 1: Create New Project

Run the InstantHMI LaunchPad. You will see the LaunchPad with four Projects in the pull-down list: Demo, MyProject, 'Quick Start PC', and Sample Project. Since we have provided the 'Quick Start - PC' project for training purposes, you will not use the **New Project Wizard** as was done in Sections

15.2.1 - 15.2.5. Instead just use the Project pull-down list and select 'Quick Start - PC'. From the Thumbnail view you will note that no screens are included in the selected 'Quick Start - PC' project. As part of the training, you will design the 'System Status Screen' (Figure 15-38) using the LaunchPad Screen Designer and test it using the Runtime Engine (on the Windows PC platform).

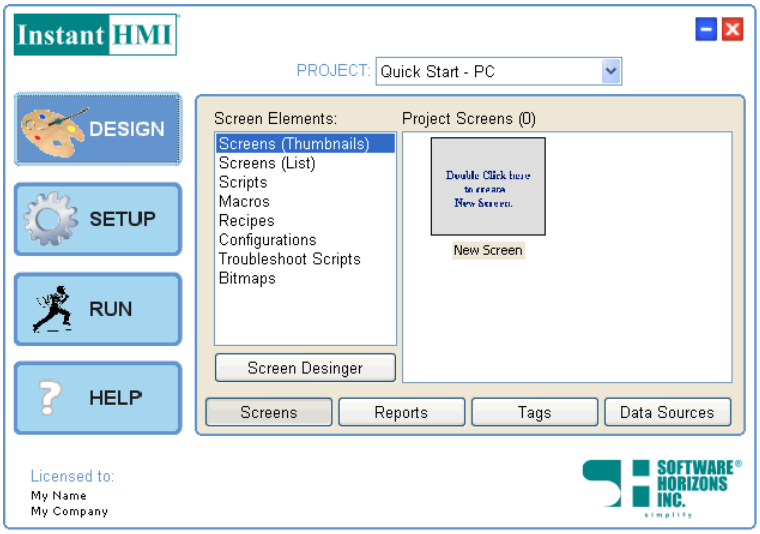

Figure 15-9: 'Quick Start - PC' Project Ready for New Screen Design

Step 2: Define Data Source

There is no need to define a Data Source for the Local Memory used in the PC Simulation of the PLC as they use the default internal Data Source. So skip this step.

Step 3: Identify Tags

For training purposes, while explaining the design of screens, initially we avoid the use of the PLC and use a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the PLC). This will allow us to discuss the design of the screen objects independent of the PLC. The tags (variables of interest) in the simulation are tabulated below.

Tag Name	Data Type	Data Format	Memory Type	Memory Address	Tag Group Membership
Alarm State-Tank A	Monitor	Integer	Local	102	Tank A
Alarm State-Tank B	Monitor	Integer	Local	152	Well
Booster Pump Rate	Monitor	Integer	Local	164	System
Limit Switch	Monitor	Integer	Local	161	System
Lower Limit	Monitor	Integer	Local	166	System
Pump Status	Monitor	Integer	Local	168	System
Pump Status-Scaled	Monitor	Integer	Local	168	System
System Alarm	Monitor	Integer	Local	167	System
System Date	Monitor	Date	Local	1	
System Time	Monitor	Time	Local	4	
Upper Limit	Monitor	Integer	Local	165	System
Water In Rate	Monitor	Integer	Local	162	System
Water Level - Tank A	Monitor	Integer	Local	101	Tank A
Water Level - Tank B	Monitor	Integer	Local	151	Well
Water Out Rate-Tank A	Monitor	Integer	Local	163	System
Water Out Rate-Tank B	Monitor	Integer	Local	169	System
Well Run Mode	Monitor	Integer	Local	181	System, Tank A, Well
Well Status	Monitor	Integer	Local	182	System, Tank A, Well
Well Status-Scaled	Monitor	Integer	Local	170	System, Tank A, Well

To save you time, we have included a tag database with the above Local Memory tags pre-defined. We describe below in detail, how you can create one of these tags (Water Level - Tank A). The data registers and I/O from your PLC (connected by Serial or Ethernet link to PC InstantHMI Runtime Engine) will be used in the definition of your tags and Data Source for your PLC (Appendix A).

Step 4: Design System Status Screen

You will design the 'System Status Screen - Stage 1' using the LaunchPad Screen Designer and test it using the Runtime Engine (on the Windows PC platform).

Note: The screens you create in training are also provided in the 'Backup of Training Screens' folder. You may finish the screen creation task or choose to skip some of the object creation details (to save time). We recommend you 'breeze through' the screen creation task, test your screen and then replace your screen with the corresponding one from the 'Backup of Training Screens' folder to continue with the training.

Click on the **LaunchPad → Design** button. If 'Quick Start - PC' project is not in view, select it from the Project pull-down menu. You will see that 'Quick Start - PC' project is ready for New Screen design (Figure 15-9). Click on **Screen Designer** button to run the Screen Designer. (You may also double click on the thumbnail bitmap of any screen, including 'New Screen', in the preview panel to open it in the Screen Designer.)

You are now inside the Screen Designer application. Click on the Grid tool on the Style Bar (or click on View → Grid on the Menu) to turn on Grid display. Note the Widget Palette, Tool Palette and Clipboard Tools displayed. If, for example, Widget Palette is not in your view, then click View → Widget Palette to make it visible on your screen designer view window.

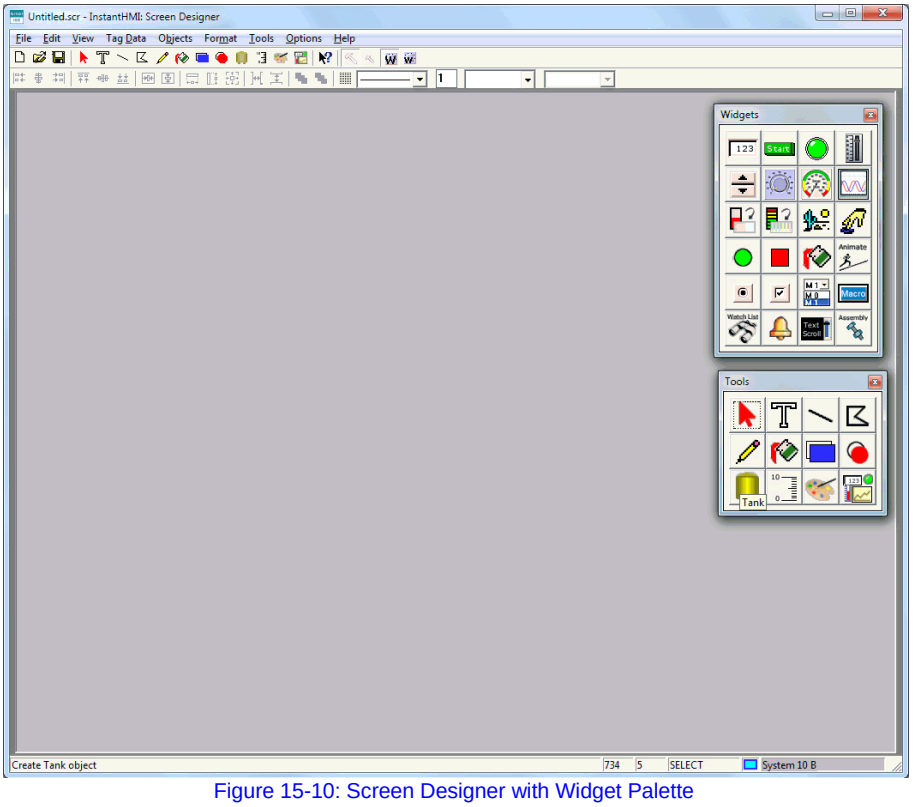

Figure 15-10: Screen Designer with Widget Palette

In Stage 1 of the System Status screen design, we create a boxed display for '**Tank A Status**' as shown here.

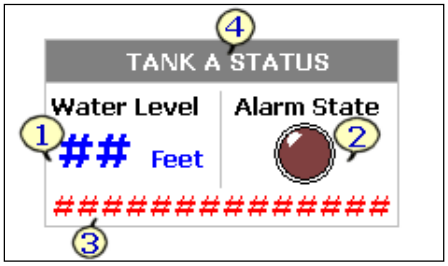

Figure 15-11: Tank A Status Display Box

1. Water Level '##'
2. Alarm State LED
3. Alarm Message Text
4. Label Text

1. Tank Water Level (Data Object)

Define Tag 'Water Level - Tank A'

In Screen Designer, click on 'Tag Data → Tag Manager → New Tag' menu. You will see the Tag Editor dialog.

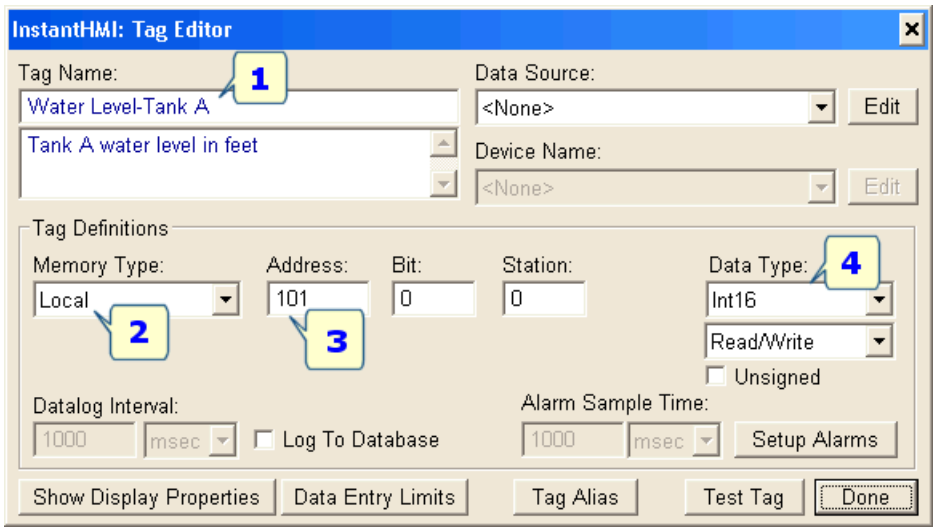

Figure 15-12: Define Tag 'Water Level - Tank A'

Enter new tag parameters as follows:

1 Enter Tag Name 'Water Level -Tank A'
2. Accept default Memory Type 'Local'
3. Enter local memory Address '101'
4. Accept default Data Type 'Int16'

Click Done to exit Tag Editor and Done to exit the Tag Manager.

Define Display Object (associated with Tag 'Water Level - Tank A')

Click on 'Objects → Data Object' menu, Position the cursor somewhere over the blank screen, and then click once on the screen (where you want to place the Data Object). The cursor position is displayed on the Status Bar.

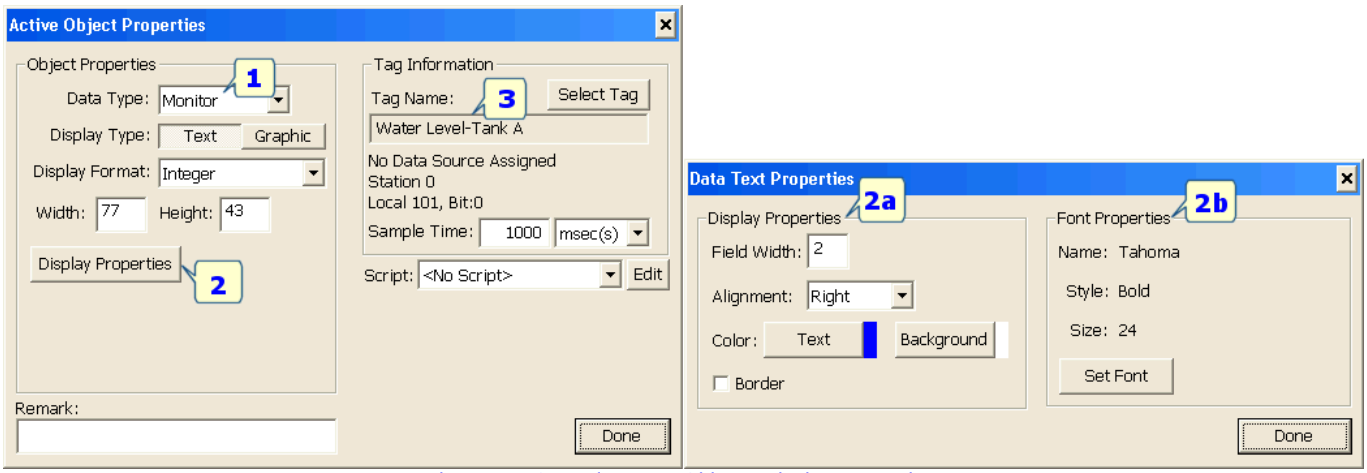

Figure 15-13: Analog Data Object - Display Properties

In the Active Display Object Properties dialog set the following properties:

1. Data Type (Monitor),
2. Display Properties
2a. Field Width (2), (Foreground and Background colors as desired)
2b. Font (as desired)
3. Tag Name (Water Level - Tank A)

A Tag identifies the Data Source and a specific memory location in the Data Source whose value is displayed in the data field. Click Done and observe that a data field marked '##' appears on the screen. At runtime, this field will display the 2-digit integer value for the tag 'Water Level - Tank A'.

2. Tank Water Level Alarm (LED Widget)

The operator can benefit from a display of the Alarm Status for the water level in Tank A. This can be indicated on the screen using an LED widget as described next.

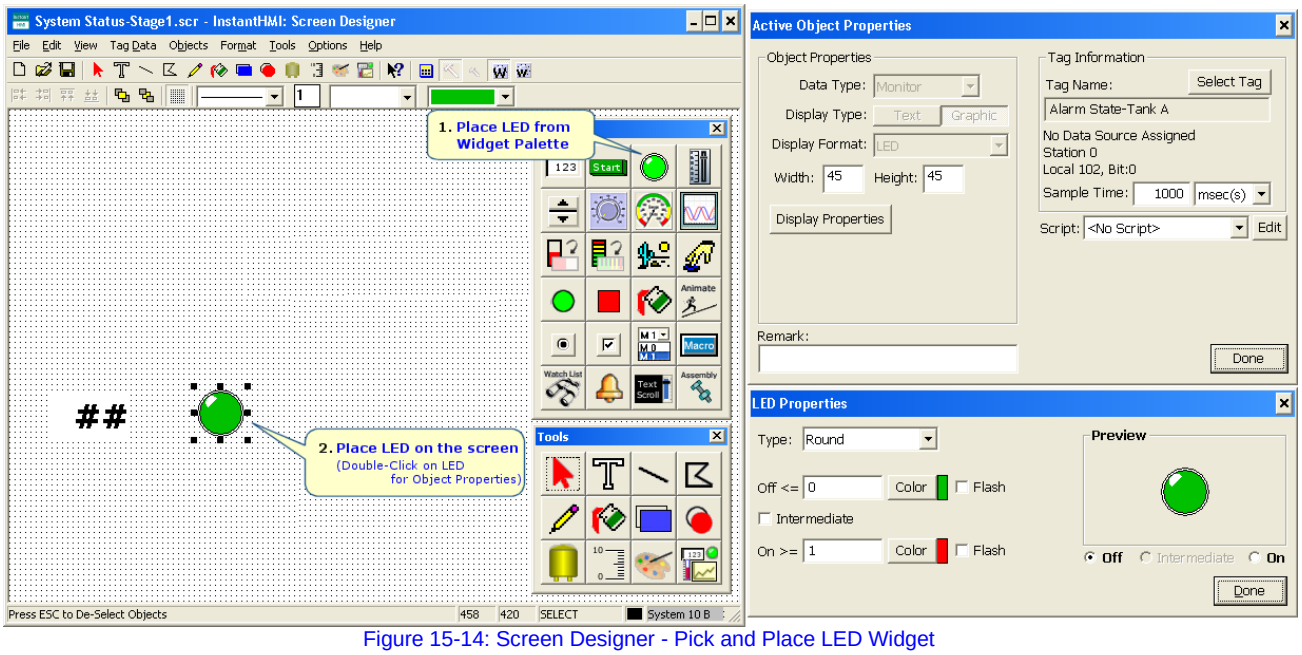

Figure 15-14: Screen Designer - Pick and Place LED Widget

Position the cursor a little to the right of the '##' field for 'Water Level - Tank A' on your screen. 'Pick and Place' LED widget (Figure 15-14) on screen as described below:

1. Pick: Click on LED widget on the Widget Palette (observe mouse cursor change)

2. Place: Click on the screen (where you want to place the LED)

Double click on LED to display its Object Properties. Click on Select Tag and associate the tag 'Alarm State - Tank A' with LED. Click on Display Properties to review LED color and on/off trigger values. Click Done to return to the Screen Designer.

3. Alarm Message Text (Message Format and Group)

We will now create appropriate Alarm Message Texts for the 'Water Level - Tank A' tag. Click on 'Tag Data → Message Groups' menu. You will see the Message Manager dialog.

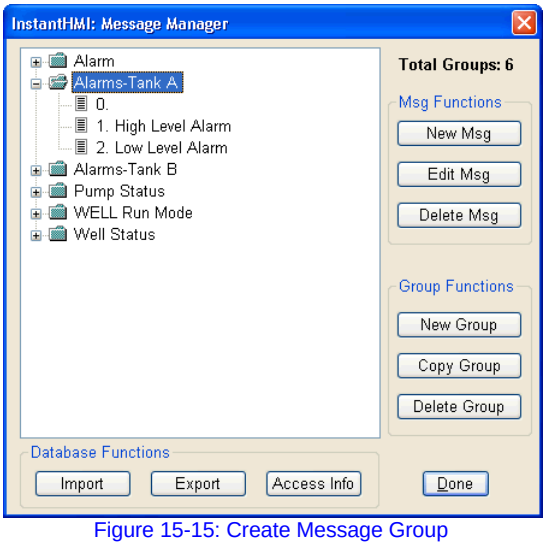

Figure 15-15: Create Message Group

Click on 'New Group' button, and enter the group name 'Alarms - Tank A'. Click on 'New Message' button, and enter the messages as shown in Figure 15-15. Click on Done button.
Now, Pick and Place the '123' Widget below the Alarm LED as indicated in Figure 15-11. Double click on the '#####' field just created on the screen and make the following changes in its Display Object Properties:

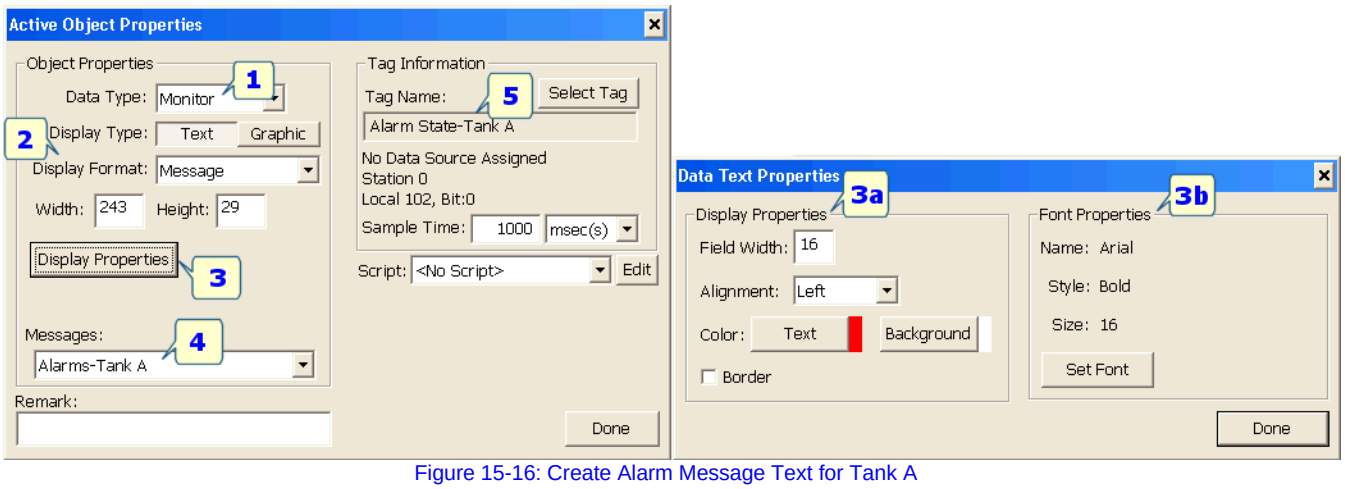

Figure 15-16: Create Alarm Message Text for Tank A

1. Data Type - Monitor
2. Display Format - Message
3. Display Properties
3a. Field Width - 16, Background/Foreground Color - as desired.
3b. Font - as desired.
4. Messages - Message Group 'Alarms - Tank A'
5. Select Tag - 'Alarm State - Tank A'

Click Done button to return to the design screen.

4. Label Text (Tool Palette)
We will now create item 4, Static Text used as label text for the Tank A Status Display Box. Click on the Text Tool (on Tool Palette) and position the cursor above the LED as shown in Figure 15-11. Enter the label text 'TANK A STATUS'. If desired, you may use the Line, Box etc. tools from the Tool Palette to complete the Tank A Status display box. You may also enter screen caption text 'Water Supply System Status', etc. and complete the 'System Status - Stage 1' screen as shown below.

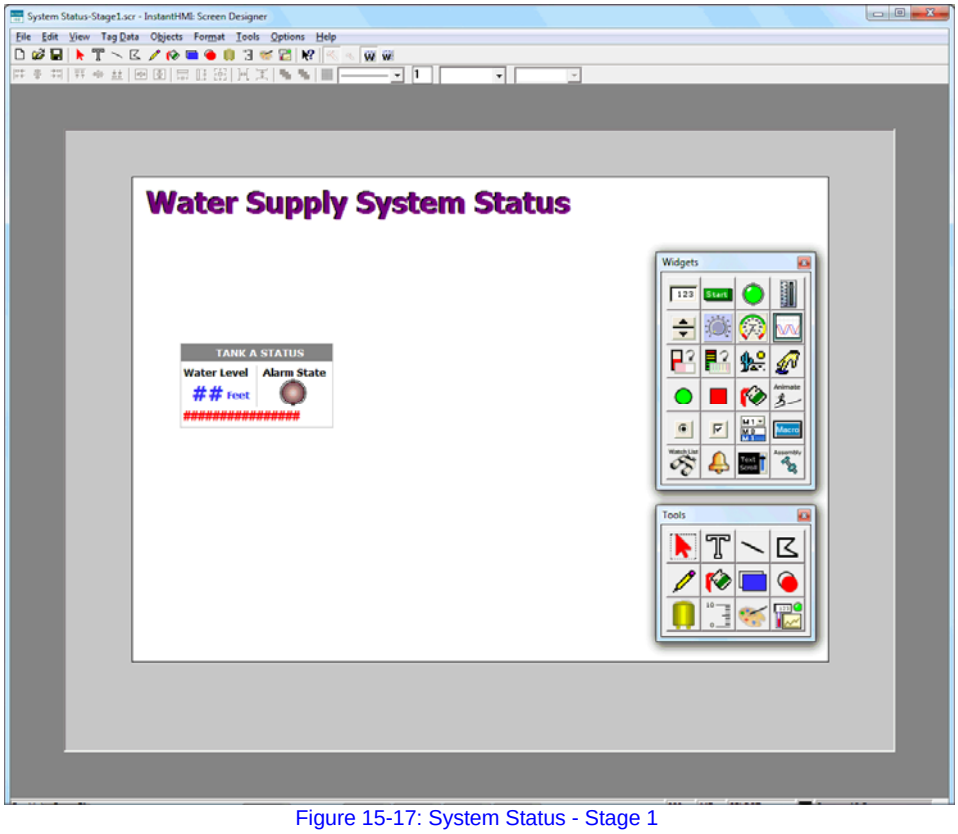

Figure 15-17: System Status - Stage 1

Click on the File Save button located on the Tool Bar (or use File → Save menu) and save your screen as 'System Status - Stage1' and use File → Exit to exit Screen Designer and return to the LaunchPad. You will see a thumbnail view of the just created screen 'System Status - Stage1' in the LaunchPad panel.

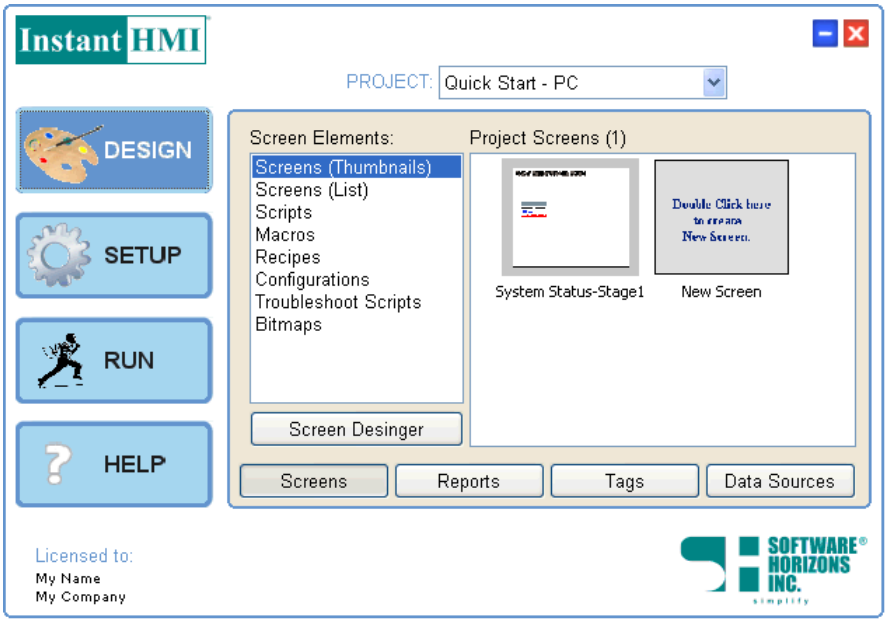

Figure 15-18: LaunchPad Designer: System Status - Stage 1

Steps 4A - 4C: Initially Skipped Steps

Skip Steps 4A - 4C at this stage. You are now ready to test 'System Status - Stage1' screen in the Runtime Engine.

Step 5: Test 'System Status - Stage1' Screen

> Please note that you must have the LaunchPad Designer installed and activated on your PC. In addition, the proper Runtime Engine must be installed and activated on the target platform. Registration and Activation (Appendix A in the InstantHMI manual) of your InstantHMI software installation is required to be able to design your screens and communicate with your controller.

Click on the LaunchPad **Run** button to test the training project 'Quick Start - PC' in the Runtime Engine (installed on the PC). Once the Runtime engine displays your screen (System Status - Stage1) you will be able to see Tank A water level and alarm indications.

For training purposes, we are simulating the Water Level changes using a Runtime script and Local Memory (instead of the I/O and control logic normally programmed in the PLC). The tags (variables of interest) in the simulation are shown in the table below.

Tag Name	Data Type	Data Format	Memory Type	Memory Address	Tag Group Membership
Alarm State-Tank A	Monitor	Integer	Local	102	Tank A
Water Level - Tank A	Monitor	Integer	Local	101	Tank A

Note the Tank level (21 Feet), LED state (Green for Normal) and Alarm Text (Blank Text for normal state) displayed on the screen.

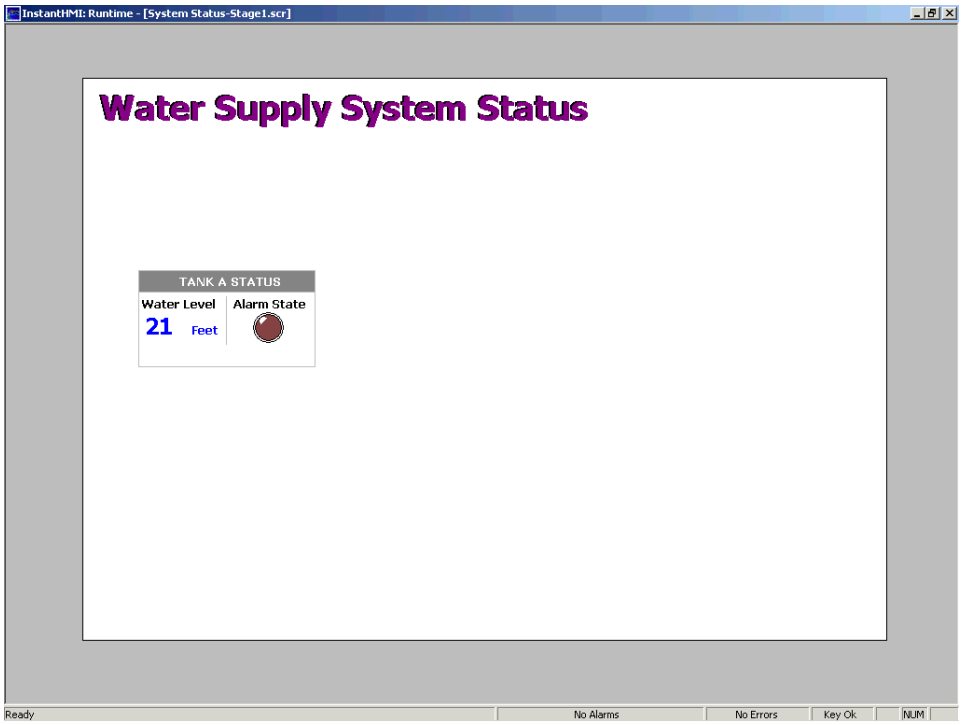

Figure 15-19: System Status - Stage1 (Runtime)

Close the window (by clicking on the on title bar) to exit the Runtime Engine and return to the LaunchPad. (When the Runtime menu is hidden from your screen view as shown, you may also right click the mouse on the screen and use the pop-up menu to Exit).

15.4.2 System Status - Stage 2 (PC)

In the last section, we successfully designed and tested a screen to display 'Tank A Status'. Double click on the thumbnail bitmap of the screen 'System Status - Stage1' in the LaunchPad preview panel to open this screen in the Screen Designer.

Now we will show you how to display the Tank Level graphically using other built-in objects (and object assemblies) in the LaunchPad Screen Designer.

Design 'System Status - Stage2' Screen

The LaunchPad Designer implements a powerful, yet flexible, design element called Object Assembly. We have included some items of interest in the 'Object Assembly' library in the 'Quick Start - PC' project. First we will show you how to use an item ('Tank A') from the Object Assembly library in your screen design. Then we will show you how to build the Tank A object assembly using native objects included in the InstantHMI Designer.

In the Screen Designer, click on Objects → Object Assembly. You will see the following dialog showing a list of available object assemblies and a preview of the selected Object Assembly. Select 'Tank A' from the list of Object Assemblies (use scroll bar or type 'T' and click on the desired selection 'Tank A').

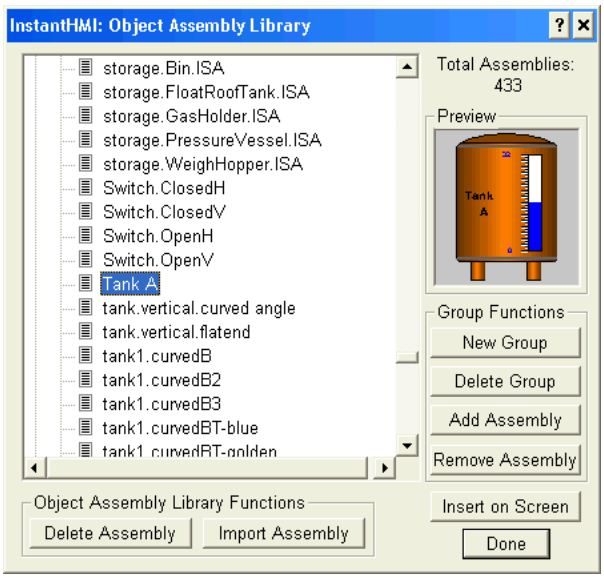

Figure 15-20: Object Assembly - Tank A

Click 'Insert on Screen' to place the selected Object Assembly on your screen (top left corner). Click on the object assembly 'Tank A' and drag it to the desired location on the screen a little to the right of the 'Tank A Status' display box designed earlier.

Click on the File Save button located on the Tool Bar (or use File → Save menu) and save your screen as 'System Status - Stage2' and use File → Exit to exit Screen Designer and return to the LaunchPad. You will see a thumbnail view of the just created screen 'System Status - Stage2' in the LaunchPad panel.

Test 'System Status - Stage2' Screen

Click on the LaunchPad **Run** button to test the training project 'Quick Start - PC' in the Runtime Engine. The project now contains two screens:

- System Status - Stage1, and
- System Status - Stage2.

The Runtime engine displays the first screen 'System Status - Stage1'. Right click on the screen (to display a pop-up menu) and click on 'Screens → Next' to navigate over to 'System Status - Stage2' screen. You will now see Tank A water level displayed graphically on Tank A as well as a number in the 'Tank A Status' display box.

Note the Tank level (14 Feet) displayed as a vertical bar (on a scale of 0 - 32 Feet). The Alarm State LED and Text message are also displayed as before.

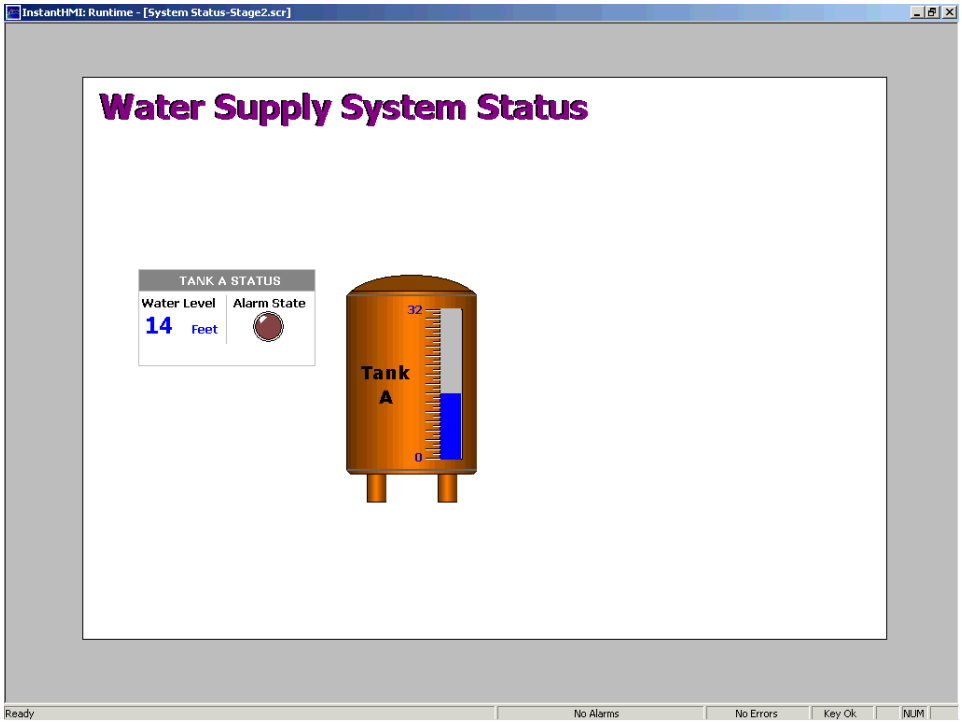

Figure 15-21: System Status - Stage2 (Runtime)

How to Build Object Assembly 'Tank A'

The LaunchPad Designer implements a powerful, yet flexible, design element called Object Assembly. We have included several items of interest in the 'Object Assembly' library in the 'Quick Start - PC' project. Earlier we showed you how to use an item ('Tank A') from the Object Assembly library in your screen design.

Here we will show you how to build the 'Tank A' object assembly using native objects included in the InstantHMI Designer. Figure 15-22 shows the component objects used in building the 'Tank A' object assembly which are listed below:

1. Tank Structure
2. Tank Level Indicator
3. Tank supply pipe, label etc.

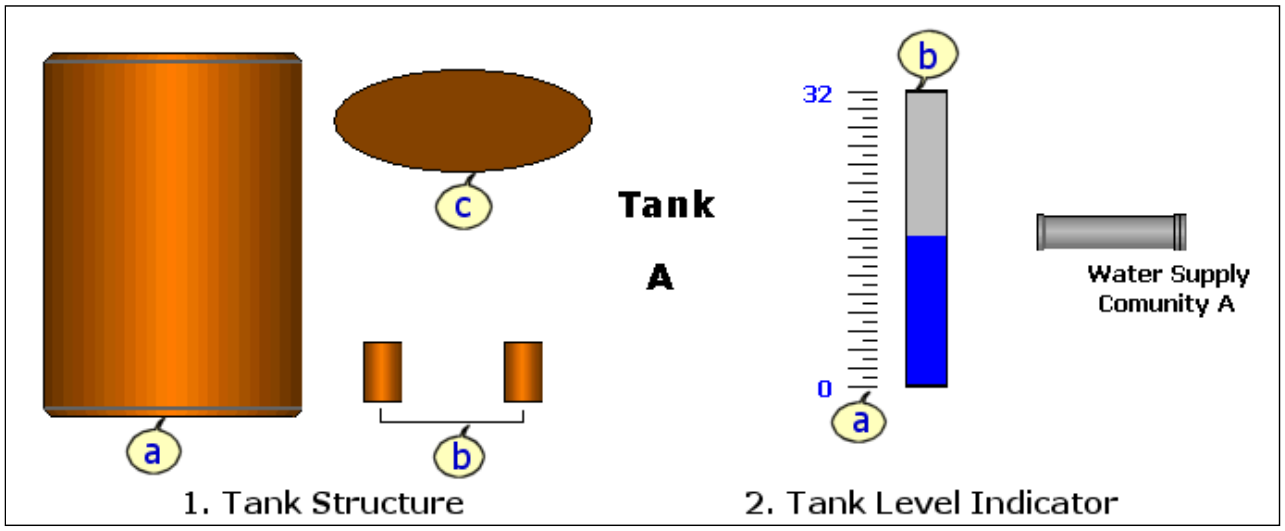

Figure 15-22: Tank A Object Assembly Components

1. Tank Structure

To build the Tank Structure we assemble together the following objects:

(a) Tank body

(b) Tank legs
(c) Tank top
In the Screen Designer click on Objects → Static Objects → Tank. You will see the 'Tank' dialog (Figure 15-23), where you make the entries as shown. Note that we selected a vertical orientation, Flat End Tank, and Tank Color as shown. Click OK and position the Tank Body on the screen as desired.

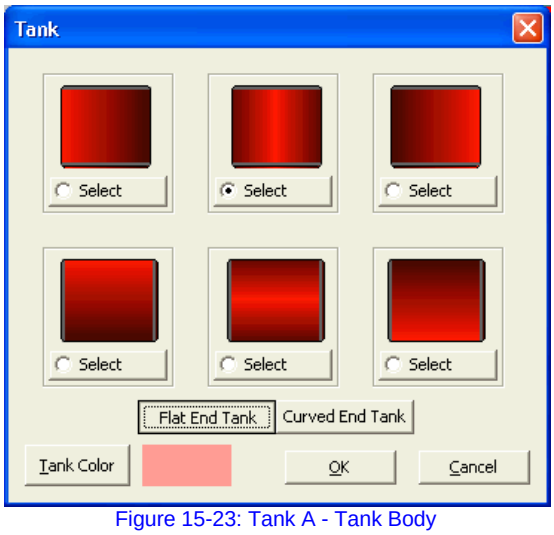

Figure 15-23: Tank A - Tank Body

Use the same Tank dialog to build the two Tank Legs. You may accept the Tank Top as is. We have chosen to re-shape the Tank Top by placing an Ellipse of the right size and color from the Tool palette. We could also have chosen to use a Curved End tank instead of Flat End. You have several flexible choices in building a Tank Structure.

2. Tank Level Indicator
To build the Tank Level Indicator we assemble together the following objects:
(a) Scale
(b) VBar widget
In the Screen Designer click on Objects → Static Objects → Scale. You will see the 'Scale' dialog (Figure 15-24), where you make the entries as shown.

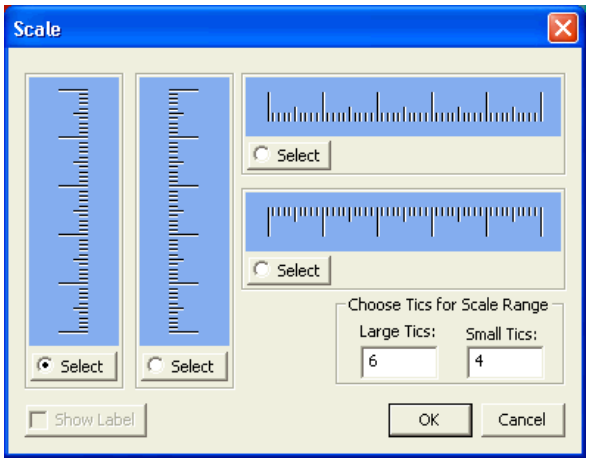

Figure 15-24: 'Tank A' Scale

Position the Scale on the Tank as desired. Now 'Pick and Place' a VBar widget (similar to what we did for the LED widget, Step 4: Design System Status Screen, Section 15.4.1), position it next to the Scale on the Tank Body, double click on the VBar widget and attach the Tag ' Water Level -Tank A'. (If you so wish, you may use 'Bar Properties' such as background, border etc. to dress up the VBar widget. You may also use the Tank dialog to create and add the outlet pipe. Finally, enter any Label Text desired).

Now you have finished assembling 'Tank A' object assembly. Use the 'Block Select' tool on the Tool Palette and drag a rectangle encompassing all the objects in the Tank A you just assembled and right click to pop-up the 'Block Menu'. Click on 'Make Object Assembly' to display the following dialog:

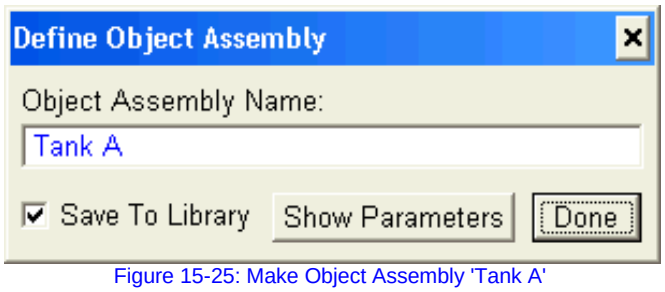

Figure 15-25: Make Object Assembly 'Tank A'

Enter the name 'Tank A' and click Done. You have successfully created the Object Assembly 'Tank A' and stored it in the Object Assembly library.

15.4.3 System Status - Stage 3 (PC)

In the last section, we successfully designed and tested a screen to display graphically Tank A level. Double click on the thumbnail bitmap 'System Status - Stage2' in the LaunchPad preview panel to run the Screen Designer.

Design 'System Status - Stage3' Screen

In the Screen Designer, click on Objects → Object Assembly. You will see the following dialog showing a list of available object assemblies and a preview of selected Object Assembly. Select 'Well' from the list of Object Assemblies (use scroll bar or type 'W' and click on the desired selection 'Well').

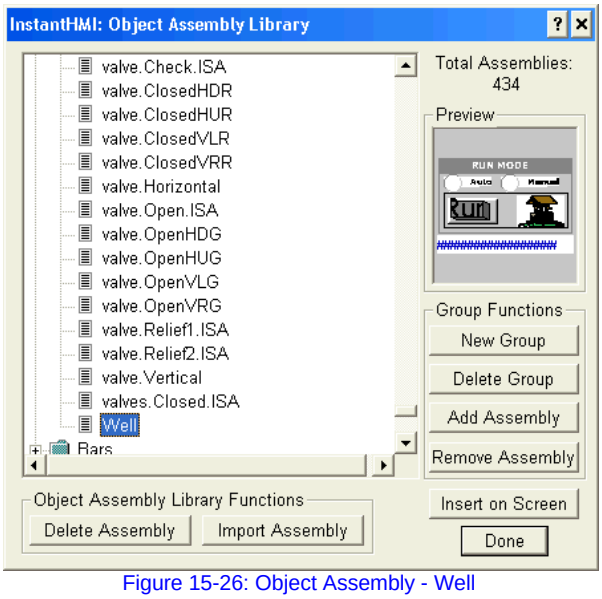

Figure 15-26: Object Assembly - Well

Click 'Insert on Screen' to place the selected Object Assembly on your screen (top left corner). Click on the object assembly 'Well' and drag it to the desired location on the screen below the 'Tank A Status' display box (and below the bottom of Tank A).

You may add pipes using the Tank dialog (Objects → Static Objects → Tank) as discussed in How to build Object Assembly 'Tank A', Section 15.4.2. We have included an Object Assembly named 'Date-Time'. Place it on (the top right corner of) the screen as shown in Figure 15-27.

To learn how to define Date and Time, select the 'Date-Time' object assembly, right click on it to pop-up a menu and select 'Break Object Assembly'. Now you can double-click on the Date field and view its Display Object Properties (Field Width of 10, and the three 16-bit words required to store month, date and year starting at memory address defined in tag 'System Date'). Similarly, discover the Display Object Properties for Time field.

Click on the File Save button located on the Tool Bar (or use File → Save menu) and save your screen as 'System Status - Stage3' and use File → Exit to exit Screen Designer and return to the LaunchPad. You will see a thumbnail view of the just created screen 'System Status - Stage3' in the LaunchPad panel.

Test 'System Status - Stage3' Screen

Click on the LaunchPad **Run** button to test the training project 'Quick Start - PC' in the Runtime Engine. The project now contains three screens:

- System Status - Stage1,
- System Status - Stage2 and
- System Status - Stage3.

The Runtime engine displays the first screen 'System Status - Stage1'. Right click on the screen (to display a pop-up menu) and click on 'Screens → Select', click on 'System Status - Stage3' and click OK to navigate over to 'System Status - Stage3' screen. You will now see Well Run Mode display in addition to the Tank A water level displayed graphically, as well as a number in the 'Tank A Status' display box.

Note the Well Mode 'Auto' and Well Status 'Running'. The Well pump is supplying water to Tank A, whose level (23 Feet) is displayed as a vertical bar (on a scale of 0 - 32). The Alarm State LED and Text message are also displayed as before. Click on the Manual mode radio button (to enable manual control from the screen) and then click on Off button to turn off the Well Pump. Notice that the Tank A level starts dropping as the Community A supplied by Tank A continues to draw water from Tank A. (Our Water Supply System simulation is implemented in a Runtime script. If you like to see a different simulation you may change the script to suit your simulation scenario).

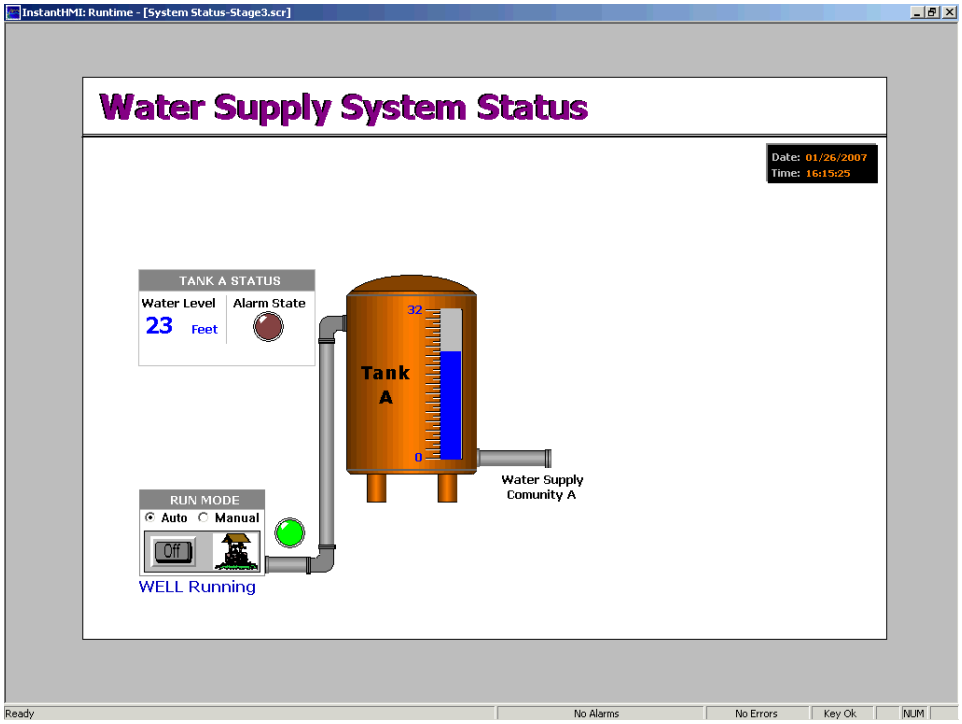

Figure 15-27: System Status - Stage3 (Runtime)

15.4.4 System Status - Stage 4 (PC)

In the last section, we successfully designed and tested a screen to monitor and control 'Well Run Mode' in addition to displaying Tank A level graphically. Double click on the thumbnail bitmap 'System Status - Stage3' in the LaunchPad panel to run the Screen Designer.

Design 'System Status - Stage4' Screen

In the Screen Designer, click on Objects → Object Assembly. You will see the following dialog showing a list of available object assemblies and a preview of the selected Object Assembly. We have already used Tank A, Tank A Status, Well and Date-Time object assemblies on our screen 'System Status - Stage3'.

Select 'Booster Pump' from the list of Object Assemblies and place it to the right of Tank A above Water Supply pipe from Tank A. Select 'Tank B' from the list of Object Assemblies and place it to the right and above Booster Pump. As described before, place elbows and pipes to connect Tank A, Booster Pump and Tank B. Select 'Tank B Status' from the list of Object Assemblies and place it above Booster Pump and to the left of Tank B.

Click on the File Save button located on the Tool Bar (or use File → Save menu) and save your screen as 'System Status - Stage4' and use File → Exit to exit Screen Designer and return to the LaunchPad. You will see a thumbnail view of the just created screen 'System Status - Stage4' in the LaunchPad panel.

Test 'System Status - Stage4' Screen

Click on the LaunchPad **Run** button to test the training project 'Quick Start - PC' in the Runtime Engine. The project now contains four screens:

- System Status - Stage1,
- System Status - Stage2,
- System Status - Stage3 and
- System Status - Stage4.

The Runtime engine displays the first screen 'System Status - Stage1'. Right click on the screen (to display a pop-up menu) and click on 'Screens → Select', click on 'System Status - Stage4' and click OK to navigate over to 'System Status - Stage4' screen. You will now see a display of Tanks, Booster Pump and Well displayed on screen.

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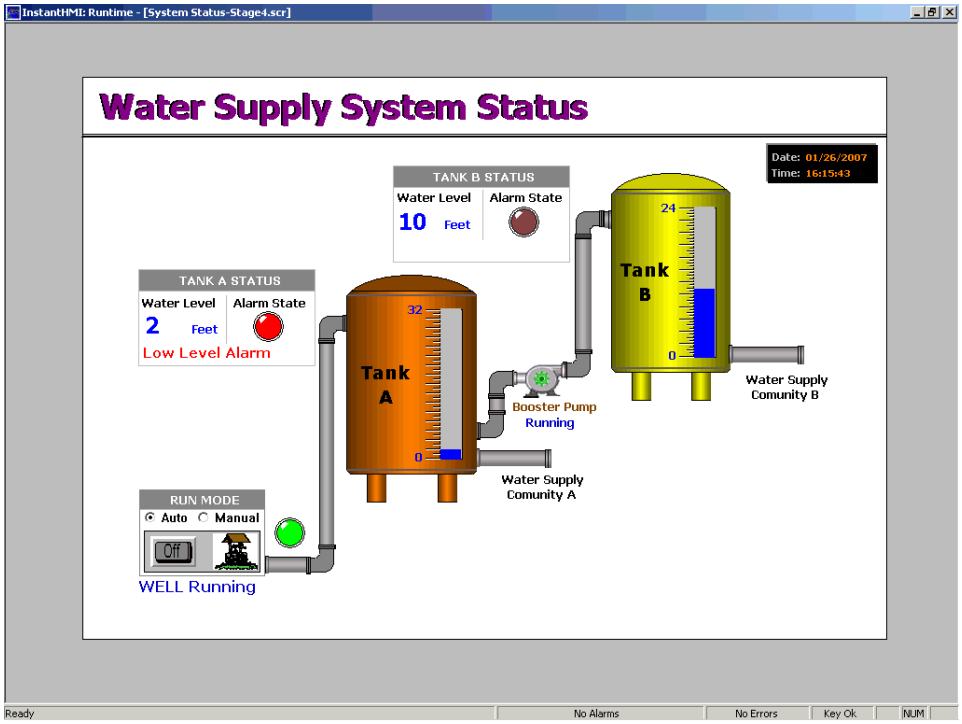

Figure 15-28: System Status - Stage4 (Runtime)

Our Water Supply System simulation is implemented in a Runtime script. You will be alerted to Alarm conditions in Tank Levels. You will be able to monitor the Tank Levels, Well State, as well as override Well control in Manual mode. If you like to see a different simulation you may change the script to suit your simulation scenario.

15.4.5 System Status (PC)

Double click the thumbnail bitmap labeled 'System Status - Stage4' in the LaunchPad preview panel to run the Screen Designer. Our Water Supply System Status screen is nearly complete. The only items we wish to add to improve usability by the Operator are the following:

1. Add a navigation button to switch to Trend Screen (discussed in Section 15.4.6)
2. Add a Help Screen (to remind the operator of useful items)

We will explain these steps in Section 15.4.7 where we put the finishing touches to complete the InstantHMI Solution for the Water Supply System.

Click on the File Save button (or use File → Save menu) and save your screen as 'System Status' and use File → Exit to exit Screen Designer and return to the LaunchPad.

15.4.6 Tank Level Trends (PC)

The System Status screen created previously is useful for monitoring alarm conditions and instantaneous tank levels. To give the operator a better sense of system behavior, a graphical trend of Tank Levels and Pump action (Well and Booster) will be very useful. A Trend screen, similar to the one shown in Figure 15-29, can accomplish this.

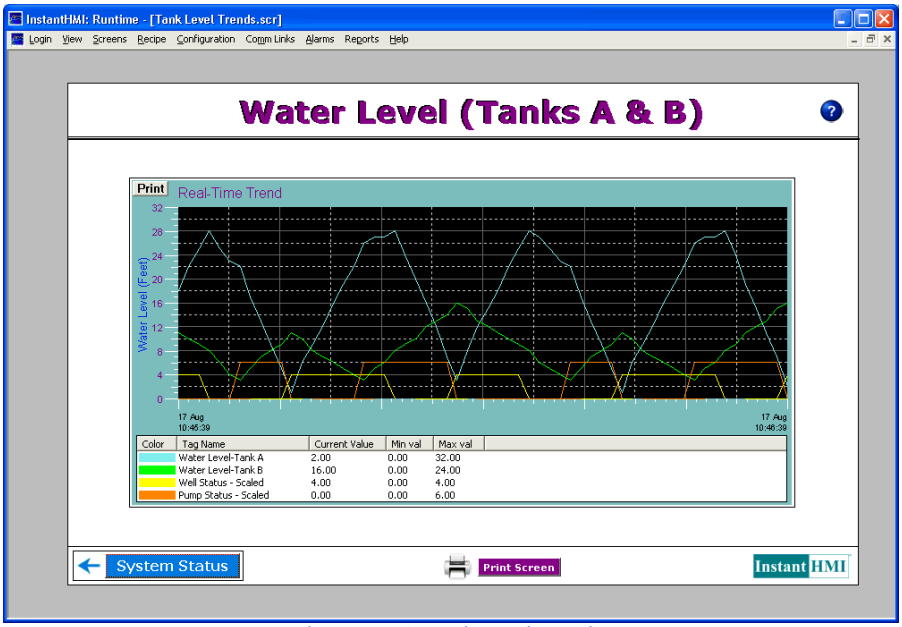
InstantHMI: Runtime - [Tank Level Trends.scr]
Login View Screens Recipe Configuration Comm Links Alarms Reports Help
Water Level (Tanks A & B)
Print
Real-Time Trend
Water Level (Feet)
Color Tag Name Current Value Min val Max val
Water Level-Tank A 2.00 0.00 32.00
Water Level-Tank B 16.00 0.00 24.00
Well Status - Scaled 4.00 0.00 4.00
Pump Status - Scaled 0.00 0.00 6.00
System Status
Print Screen
InstantHMI

Figure 15-29: Tank Level Trends

Design 'Tank Level Trends' Screen

We now describe how to design this Trend Screen (with three display objects):

1 Tank Level Trends (Plot Object)

'Pick and Place' a plot widget with the following Display Object Properties and Plot Parameters:

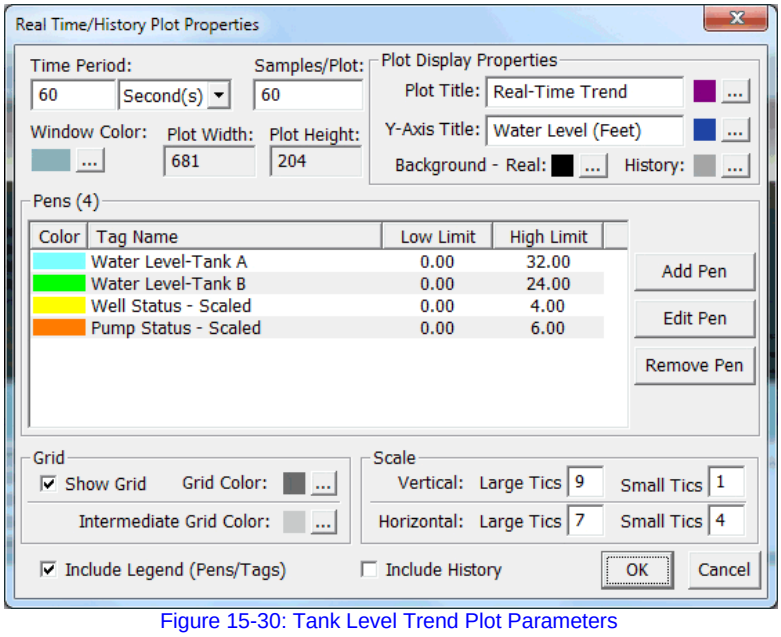

Figure 15-30: Tank Level Trend Plot Parameters

- Time Period: 60 Seconds, sampled every second
- Plot Background: Black (this will take effect in runtime)
- Pen 1: 'Water Level - Tank A'
- Pen 2: 'Water Level - Tank B'
- Pen 3: 'Well Status'
- Pen 4: 'Pump Status'

2 Screen Caption (Text Object)

Add the screen caption text 'Water Level (Tanks A & B)'.

3 Navigation Aid (Touch Zone Object)

'Pick and Place' the Touch Zone tool and create a touch zone (for switching to the 'System Status' screen) as shown:

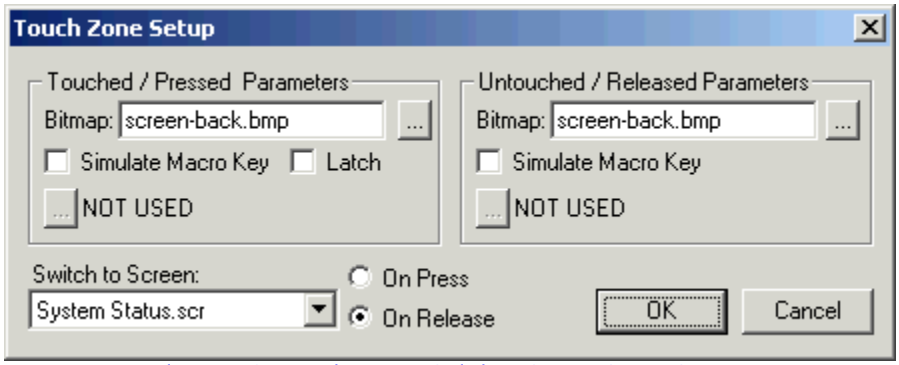

Figure 15-31: Touch Zone to Switch to 'System Status' Screen

You may add a 'Logo' or other objects to the screen as desired.

Click on the File Save button located on the Tool Bar (or use File → Save menu) and save your screen as 'Tank Level Trends' and use File → Exit to exit Screen Designer and return to the LaunchPad. You will see a thumbnail view of the just created screen 'Tank Level Trends' in the LaunchPad panel.

Test 'Tank Level Trends' Screen

Click on the LaunchPad **Run** button to test the training project 'Quick Start - PC' in the Runtime Engine. The project now contains six screens:

- System Status - Stage1,
- System Status - Stage2,
- System Status - Stage3,
- System Status - Stage4,
- System Status and
- Tank Level Trends

The Runtime engine displays the first screen 'System Status - Stage1'. Right click on the screen (to display a pop-up menu) and click on 'Screens → Select', click on 'Tank Level Trends' and click OK to navigate over to 'Tank Level Trends' screen. You will now see a plot displaying trends of Tank Levels. In addition, you will see the states of Booster and Well Pumps displayed on screen.

Click the ' ← System Status' touch zone to navigate to the System Status screen. Close the window (by clicking on the on title bar) to exit the Runtime Engine and return to the LaunchPad. (When the Runtime menu is hidden from your screen view as shown, you may also right click the mouse on the screen and use the pop-up menu to Exit).

15.4.7 Water Supply System Solution - PC Runtime Platform

Our sample application (Fresh Water Supply System) can be adequately presented to the operator using two screens:

System Status Screen
This screen (as designed in Sections 15.4.1 - 15.4.5) will display Tank Levels, Alarm States, etc. and allow for operator override of the automated requests for Pump actions.

Tank Level Trends Screen
This screen (as designed in Section 15.4.6) will show the real time trend of the tank water levels and the Pump action.

To complete the project design we do the following:
1. Setup project with only the two finished screens
2. Add Screen Navigation Aid on 'System Status' screen
3. Add Print button to save a runtime snapshot of the screen
4. Add Help Screens

Many other enhancements such as Reports, Datalogging, etc. are possible, but are not described here.

> Note: We have provided the finished project in your InstantHMI installation as 'Quick Start-PC/Backup-Finished'. We have also provided a backup of the project you started with in 'Quick Start-PC/Backup-Start' in case you wish to restore your project for re-training from the starting point. If you wish to skip the steps in the rest of this section you may do so and copy all files from 'Quick Start-PC/Backup-Finished' to 'Quick Start - PC' to check out the finished project. We recommend that at a minimum you review the rest of this section.

Setup Runtime Project Screens
Click on the Setup command button on the LaunchPad. Note that six Project Screens are included in the Quick Start - PC project as shown in Figure 15-32. Select 'System Status -Stage1' Screen in the right panel and click on Remove button to remove this screen from the project. Note that the removed screen is **not** deleted and remains available so that later you may Add/Insert this screen in your list of Project Screens. Repeat three more times to end up with just the two screens as shown in Figure 15-33.

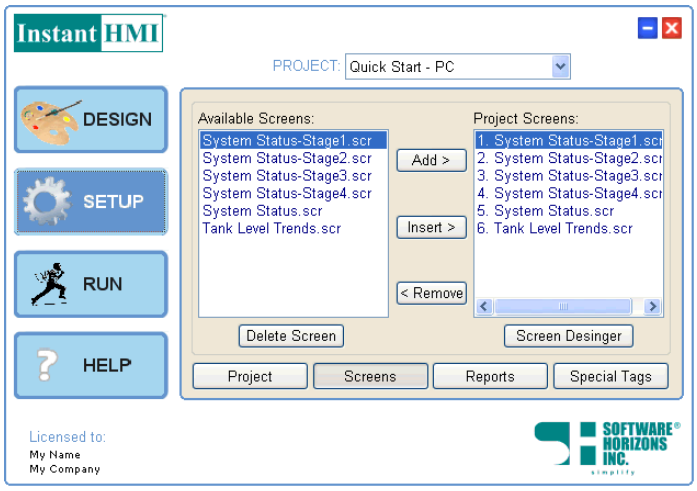

Figure 15-32: Quick Start PC - Project Screen Setup (Initial)

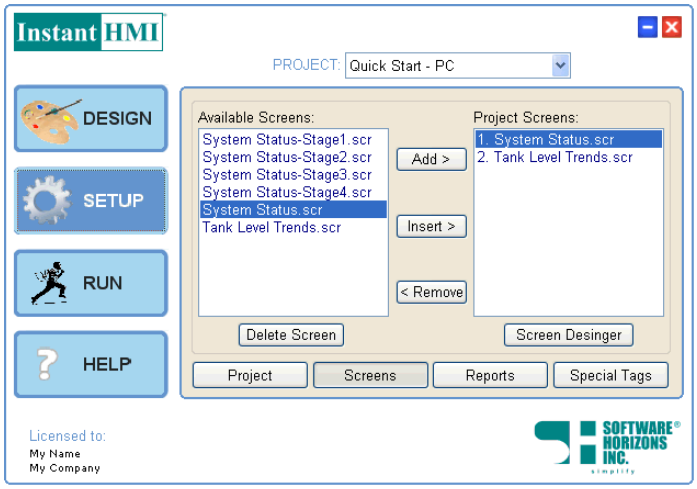

Figure 15-33: Quick Start PC - Project Screen Setup (Final)

Add Screen Navigation Aid to System Status Screen

In our two-screen setup, it is convenient to provide 'Touch Zones' on each screen to switch to the other screen. In Section 15.4.6 we created a touch zone in the 'Tank Level Trends' screen for switching to the 'System Status' screen. Similarly, we add a Touch Zone in 'System Status' screen (Figure 15-34) to provide a navigation aid to switch to the 'Tank Level Trends' screen.

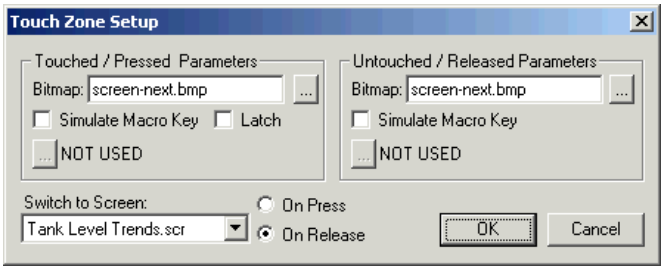

Figure 15-34: Touch Zone to Switch to 'Tank Level Trends' Screen

Add Print Button for Runtime Snapshot

For your convenience, we have provided an Object Assembly 'Print Screen' which you may position on the bottom of your System Status screen. Alternatively, create a 'Print Screen' macro button as shown in the rest of this section. In the LaunchPad Designer, click on View → Clipboard Palette to make the Clipboard Tool Palette visible. Pick and Place a Macro Button on screen, double click on it and enter the following properties:

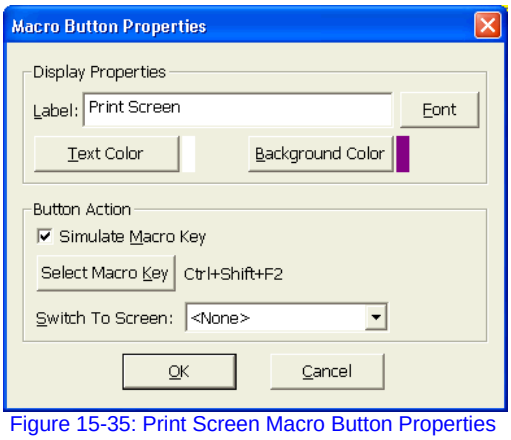

Figure 15-35: Print Screen Macro Button Properties

If the '<CTRL><SHFT>F2' macro is not created, create it in the Macro Editor (that pops-up when you click on 'Select Macro Key' button See Figure 15-36).

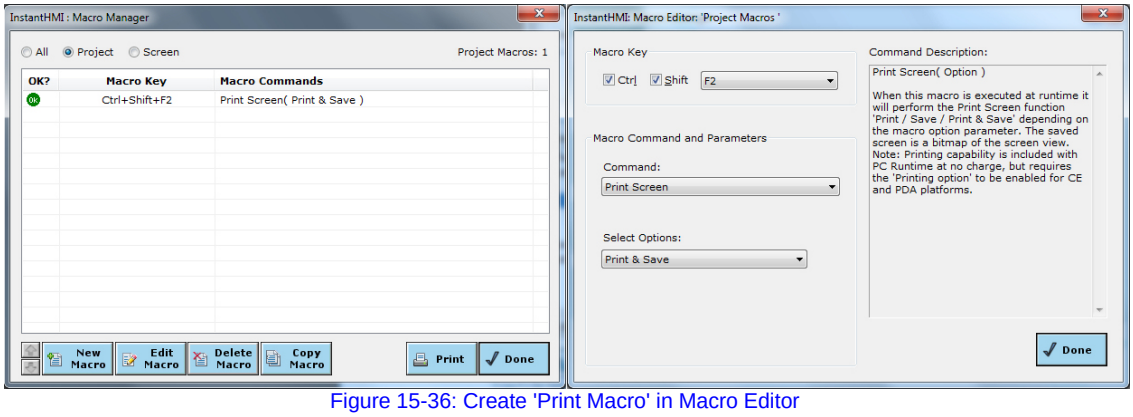
InstantHMI : Macro Manager
All
Project
Screen
Project Macros: 1
OK?
Macro Key
Macro Commands
Ctrl+Shift+F2
Print Screen(Print & Save)
New Macro
Edit Macro
Delete Macro
Copy Macro
Print
Done
InstantHMI: Macro Editor: 'Project Macros '
Macro Key
Ctrl
Shift
F2
Command Description:
Print Screen(Option)
When this macro is executed at runtime it will perform the Print Screen function 'Print / Save / Print & Save' depending on the macro option parameter. The saved screen is a bitmap of the screen view. Note: Printing capability is included with PC Runtime at no charge, but requires the 'Printing option' to be enabled for CE and PDA platforms.
Macro Command and Parameters
Command:
Print Screen
Select Options:
Print & Save
Done

Figure 15-36: Create 'Print Macro' in Macro Editor

Click on the File Save button (or use File → Save menu) and save your screen as 'System Status' and use File → Exit to exit Screen Designer and return to the LaunchPad.

Add Runtime Help Screens

We have provided place holders for the Runtime Help Screens and navigation aid to switch to the help screen. You can create your own Help screens for your project as desired. We have placed a Touch Zone on the top-right corner of the screen:

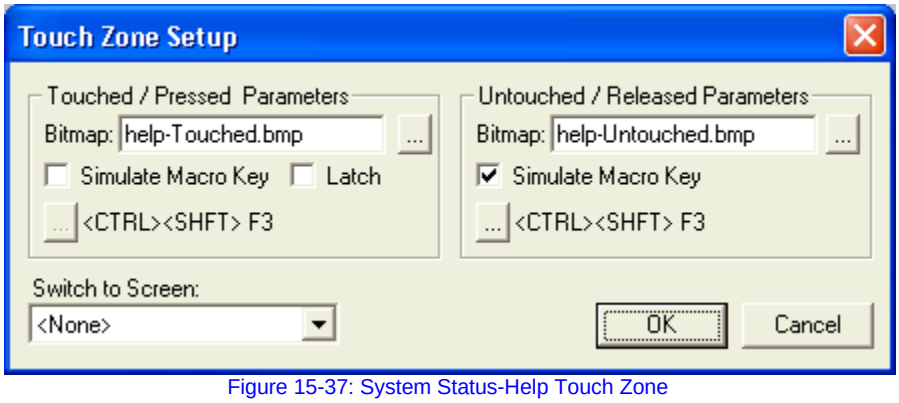

Figure 15-37: System Status-Help Touch Zone

When the operator clicks on the "?" touch zone he will see the Help Screen.

Complete Application Screens

The two finished project screens are shown below.

System Status Screen

This screen displays Tank Levels, Alarm States, etc. and allows for operator override of the automated requests for Pump actions.

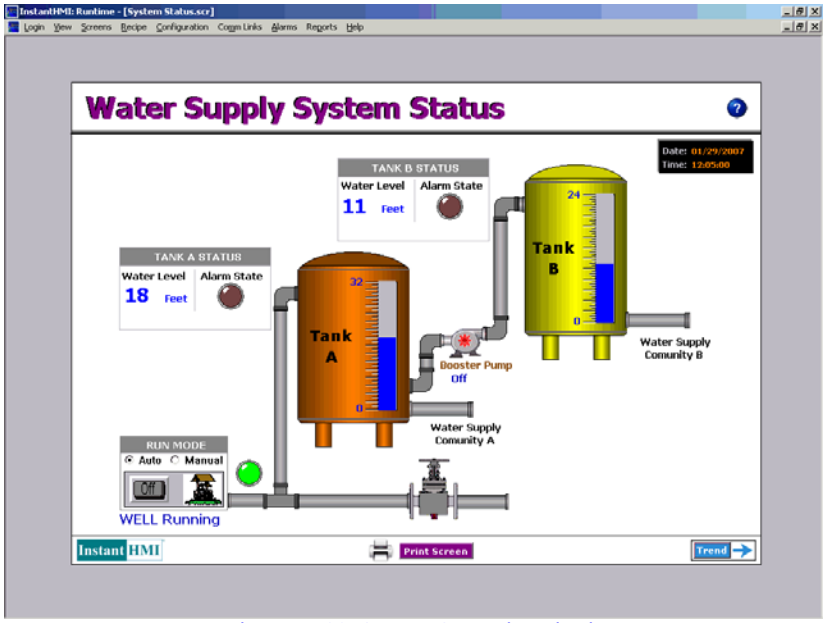

Figure 15-38: System Status (Runtime)

Tank Level Trends Screen

This screen shows the real time trend of the tank water levels and the Pump action.

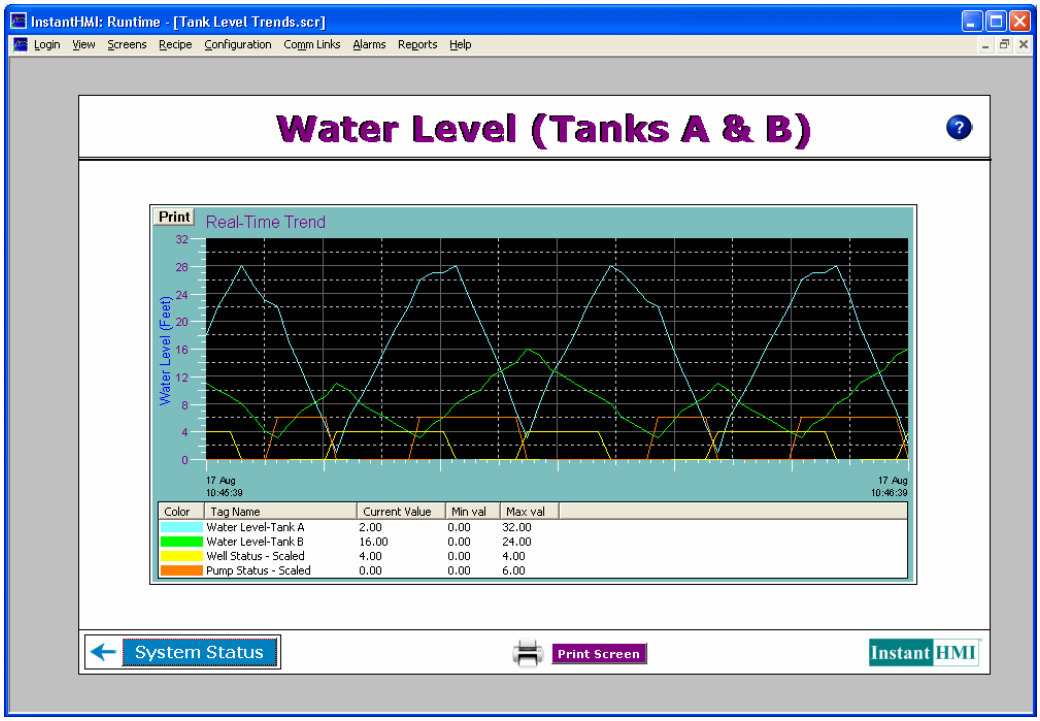

Figure 15-39: Tank Level Trends

Enhance Your 'System Status' Screen

We reviewed in Section 15.4 the InstantHMI 'Game Plan' to develop an HMI Solution for any monitoring and control application. Adhering to this Game Plan we skipped the Enhancement Steps 4A-4C and developed a solution for the Water Supply System application, which is presented in terms of two application screens in Section 15.4.

We are now ready to customize our InstantHMI Solution to enhance operator convenience.

Speedup VBar Widget Response

You may observe that the VBar widget for tank levels does not respond as smoothly as you would like. Now we shall show you how this can be improved by modifying one parameter for the VBar object on your screen.

Run the Screen Designer and click on File → Open menu (or button located on the Tool Bar) and open System Status screen. Double click on the VBar Widget on Tank A and reveal its Display Object properties (Figure 15-40). (If Tank A is part of an Object Assembly, right click on it and select 'Break Object Assembly', so you can access its component VBar object.) Change the Sample Time from 1000 msec to a more responsive 250 msec and click Done.

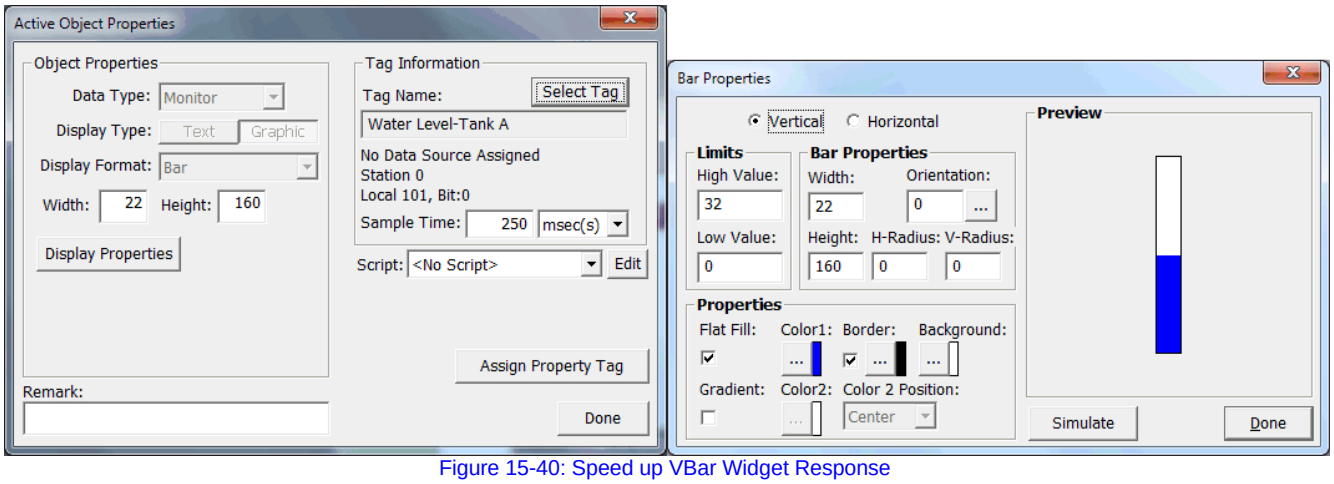

Figure 15-40: Speed up VBar Widget Response

Likewise, double click on any other object whose 'Display Object Properties' you wish to modify. Do not indiscriminately change 'Sample Time' of all objects to speed everything up. While our simulation can easily support very small sample times, each communication with a PLC to read/write its registers requires several milli-seconds and this can result in unnecessary bottle necks. In general, very small sample times (less than 100 msec) are of no use to the human operator.

Flash 'Water Level - Tank A' under Alarm Condition

Double Click on '##' field for 'Water Level - Tank A', click on Select Tag → Tag Manager → Edit Tag → Setup (Alarms). In the Alarm Setup dialog check 'Enable Alarm Checking', check High Alarm (enter value 28), check Low Alarm (enter value 4), check 'Flash Object during Alarm'. Click OK.

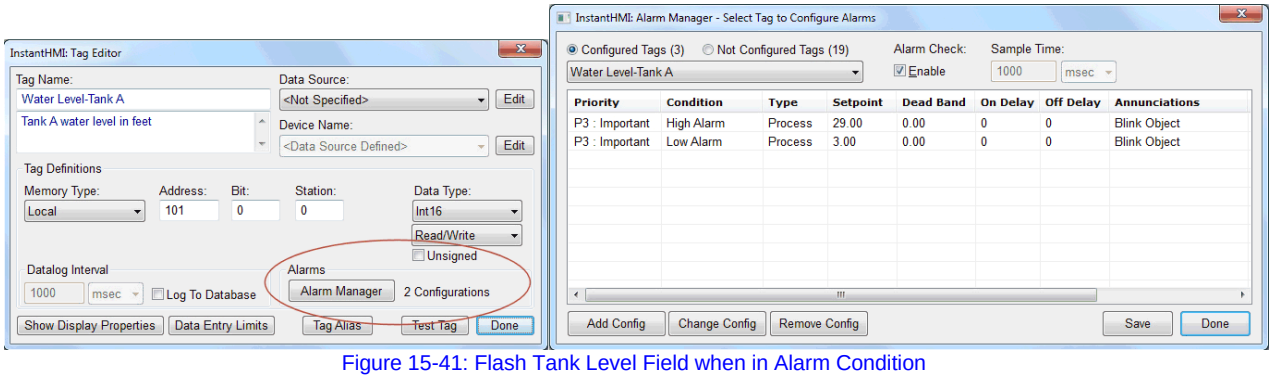

Figure 15-41: Flash Tank Level Field when in Alarm Condition

Other Enhancements

- Math Equation for Scaled Tank Level
  You may use the Script Editor (Screen Designer → Tools → Script Editor) to create powerful scripts to implement scaling and many other functions easily (InstantHMI Manual Section 8).
- Reporting
  Use the powerful reporting capabilities in InstantHMI to create Printer and Spool Reports (InstantHMI Manual Section 6).

- Special Registers
  Make any additions needed to your ladder logic in PLC to implement the special registers defined in your InstantHMI project setup to enable event driven printer reports, spool reports, etc (InstantHMI Manual Section 10.3.4).

Test Enhanced 'System Status' Screen

In the Runtime Engine when your 'System Status' screen appears note that the VBar widget response is smoother and the Tank A water level field blinks when it rises above 28 Feet or falls below 4 feet.

If the Status Bar at the bottom of screen were visible (if not Right Click on screen and click View → Status Bar) it shows the tag name and its alarm condition. If the Menu were visible (if not Right Click on screen and click View → Show Menu) you may click on Alarms to view the Alarm Tags and Alarm History as shown. To acknowledge an alarm, select it and then click on Acknowledge button on the Alarm Log dialog. Click Done to return to your Application screen.

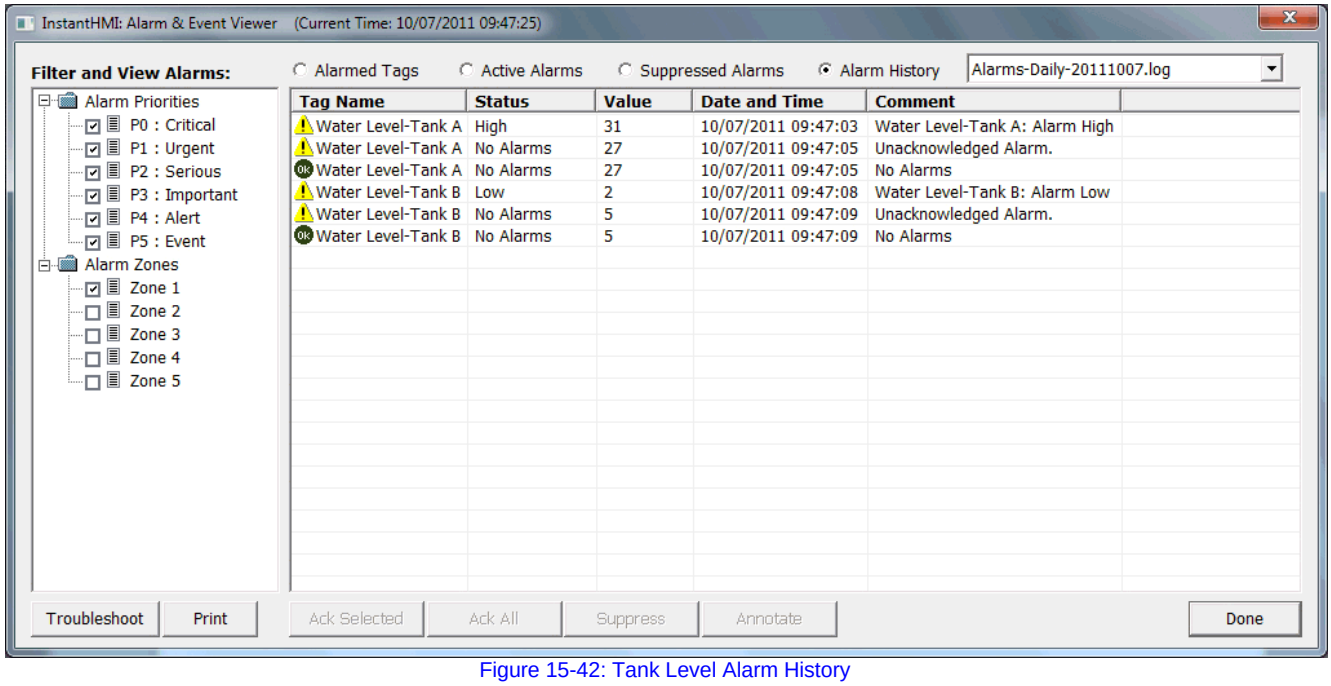
InstantHMI: Alarm & Event Viewer (Current Time: 10/07/2011 09:47:25)
Filter and View Alarms:
Alarmed Tags
Active Alarms
Suppressed Alarms
Alarm History
Alarms-Daily-20111007.log
Alarm Priorities
P0 : Critical
P1 : Urgent
P2 : Serious
P3 : Important
P4 : Alert
P5 : Event
Alarm Zones
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Tag Name | Status | Value | Date and Time | Comment
Water Level-Tank A | High | 31 | 10/07/2011 09:47:03 | Water Level-Tank A: Alarm High
Water Level-Tank A | No Alarms | 27 | 10/07/2011 09:47:05 | Unacknowledged Alarm.
Water Level-Tank A | No Alarms | 27 | 10/07/2011 09:47:05 | No Alarms
Water Level-Tank B | Low | 2 | 10/07/2011 09:47:08 | Water Level-Tank B: Alarm Low
Water Level-Tank B | No Alarms | 5 | 10/07/2011 09:47:09 | Unacknowledged Alarm.
Water Level-Tank B | No Alarms | 5 | 10/07/2011 09:47:09 | No Alarms
Troubleshoot
Print
Ack Selected
Ack All
Suppress
Annotate
Done

Figure 15-42: Tank Level Alarm History

15.5 InstantHMI Solution: Water Supply System (PPC)

InstantHMI software is 'Platform Scalable' and 'Platform Independent'. The LaunchPad Development System includes the Tag Manager, Screen Designer, etc. to help you design your project. The Tag database is independent of the platform and is re-usable on all of the supported runtime platforms. Due to size (resolution) limitations a screen layout on a PC may not be usable as is on a lower resolution Pocket PC. However, the Screen objects are re-usable across platforms. The options available to you while designing your project for the PPC platform are:

- re-size screen objects,
- eliminate less important objects,
- divide large screen into multiple smaller screens etc.

This is not hard to do.

Alternatively, you can 'Pick and Place' objects and design the screen from scratch as shown here for Pocket PC platform, 240x320 resolution design.

Figure 15-43: Pocket PC (240x320) 'System Status' in LaunchPad Screen Designer

The finished Water Supply System solution for a 240 x 320 resolution (QVGA) Pocket PC implementation are shown below.

Figure 15-44: Water Supply System Status-Pocket PC

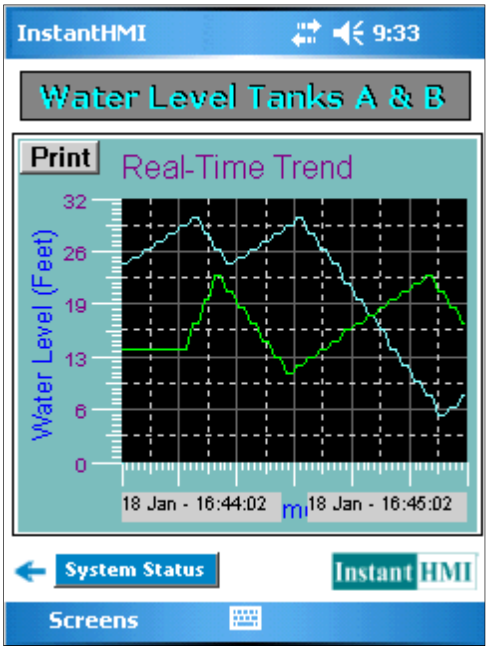

Figure 15-45: Tank Level Trends-Pocket PC

15.6 InstantHMI Solution: Water Supply System (CE)

InstantHMI software is 'Platform Scalable' and 'Platform Independent'. The LaunchPad Development System includes the Tag Manager, Screen Designer, etc. to help you design your project. The Tag database is independent of the platform and is re-usable on all of the supported runtime platforms. Due to size (resolution) limitations a screen layout on a PC may not be usable as is on a lower resolution CE Platform. However, the Screen objects are re-usable across platforms. The options available to you while designing your project for the CE platform are:

- re-size screen objects,
- eliminate less important objects,
- divide large screen into multiple smaller screens etc.

This is not hard to do.

Alternatively, you can 'Pick and Place' objects and design the screen from scratch for the CE platform as shown here for a 800x600 resolution design.

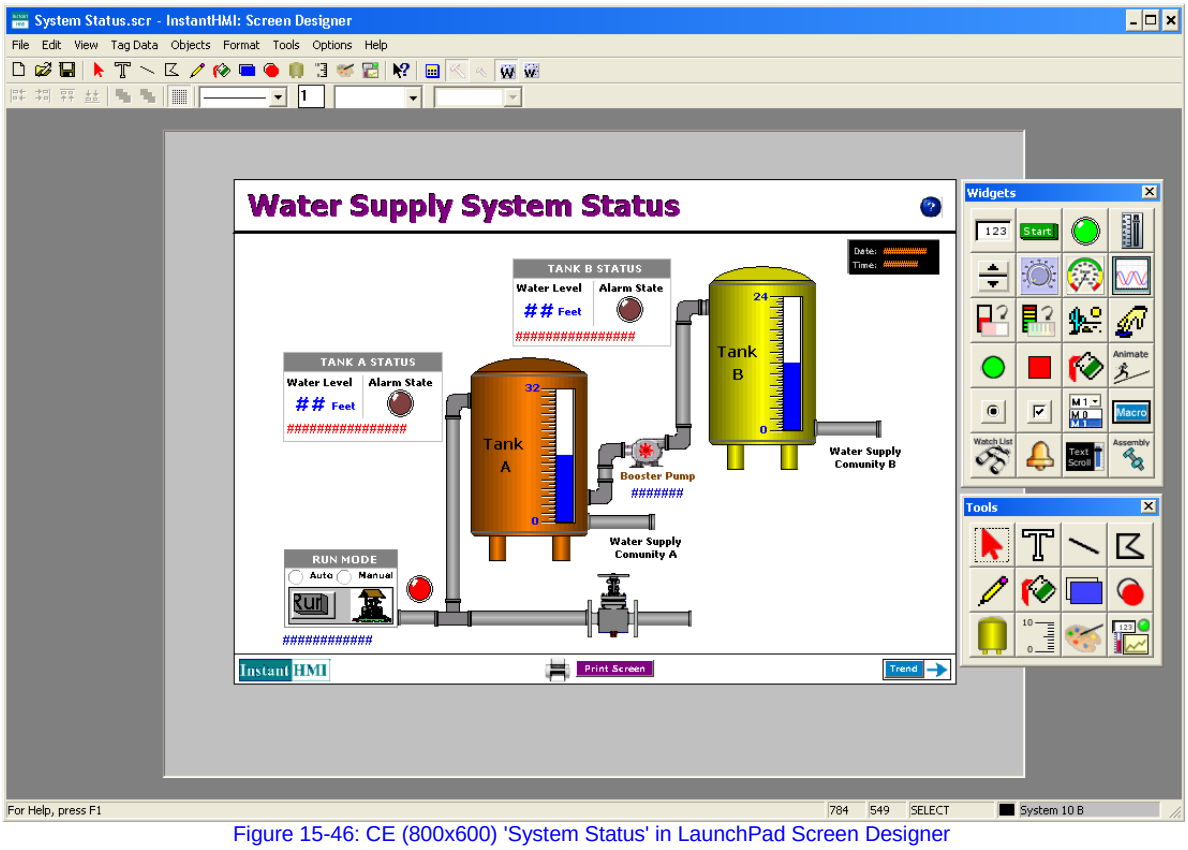

Figure 15-46: CE (800x600) 'System Status' in LaunchPad Screen Designer

The range of resolutions available on CE platforms is varied. When VGA or better resolution is supported, the PC solution will work on the CE platform. When a 240 x 320 resolution (QVGA) is supported the Pocket PC implementation approach will work on the CE.

The finished Water Supply System Status screen for a 800 x 600 resolution (SVGA) Windows CE touch panel implementation is shown below.

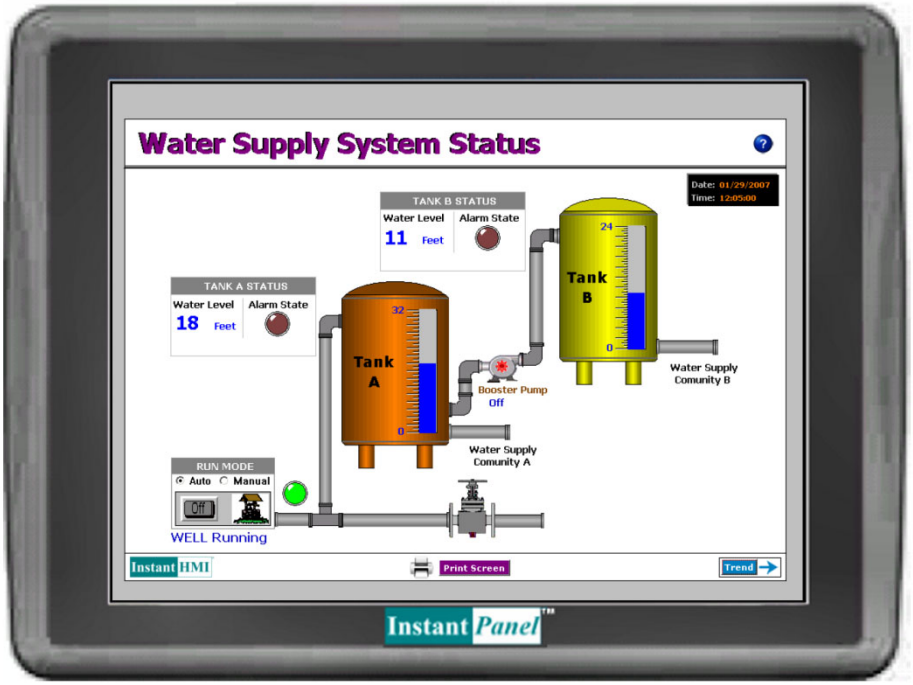

Figure 15-47: CE (800x600) 'System Status' in Runtime Engine

16 Task Scheduler in Runtime

The Task Scheduler, as implemented in InstantHMI 6.1, simplifies complex tasks that otherwise may require writing elaborate scripts. We introduce and describe the Task Scheduler functionality in the context of a reporting task to do hourly spooling and daily reports. The implementation of the reporting task is presented first (Section 16.1) without the use of Task Scheduler. Then we demonstrate (Section 16.2) how the Task Scheduler accomplishes the same task in a much easier manner.

16.1 Reporting Task: Hourly Spooling and Daily Archiving

We illustrate here the steps needed in creating Hourly spool reports, archiving the reports Daily, and have the capability to view archived reports using the Spreadsheet Viewer in the Runtime. For details see the powerful and flexible reporting capability including spooling and printing (as described in InstantHMI Manual, Section 5).The following steps are involved in designing your project to accomplish the Reporting Task:

- Design spool template files *.SPL (Section 16.1.5)
- Assign spool template files to specific spool number slots (Section 16.1.1)
- Create Spool Control Special Register tag (Section 16.1.2)
- Incorporate Report Viewer in a runtime screen (Section 16.1.3)
    - Configure Spreadsheet Viewer
    - Create Column Headings
- Implement Runtime Script to perform the desired spooling action (Section 16.1.4)
    - Set values in Spool Register for hourly spooling
    - Set values in Spool register for daily archiving

16.1.1 Assign Spool Templates: LaunchPad → Setup → Reports

When you click on the Reports button, you will see the Available Reports (Printer or Spool, depending on the radio button selection) for the selected project. Use the Assign button to define which spool report template is assigned to a specific spool report slot number in your project. For example, click on 'Report-O2.spl' spool template on the left hand panel to select it, click on slot 1 on the right panel, and then click on Assign button to make the assignment as shown (Figure 16-1).

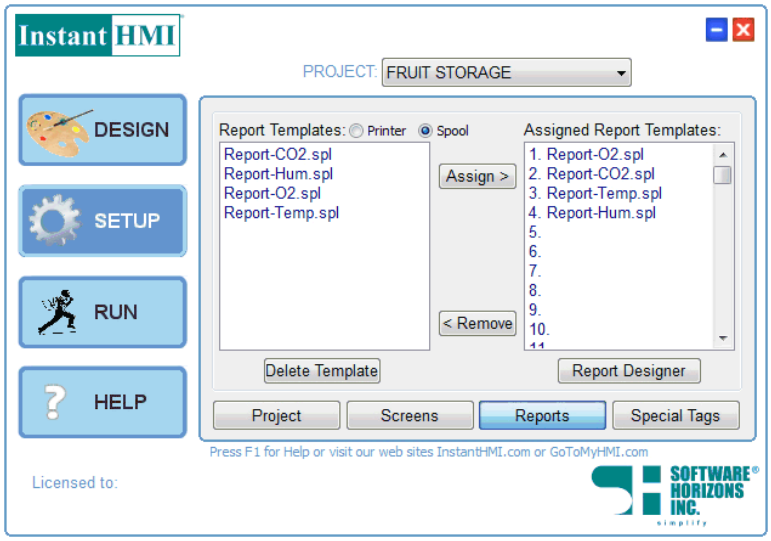

Figure 16-1: Setup → Reports → Spool

To exclude a previously assigned spool report from the project, click to highlight and select the printer report in the 'Assigned Report Templates' panel and then click on the Remove button. To create a new spool report template for the project, click on the **Report Designer** button.

The slot numbers are used at Runtime to associate reports with screens. The spool and printer report templates are used by the runtime engines to produce printer and spool reports. In addition, Special Tags can be setup in the LaunchPad to generate event driven reports and logs.

16.1.2 Create Spool Register Tag: LaunchPad → Setup → Special Tags

When you click on the Special Tags button, you will see the Tags assigned to serve special tag functions: Print Control, Spool Control, Switch Screen, Update Enable, and Recipe Enable.

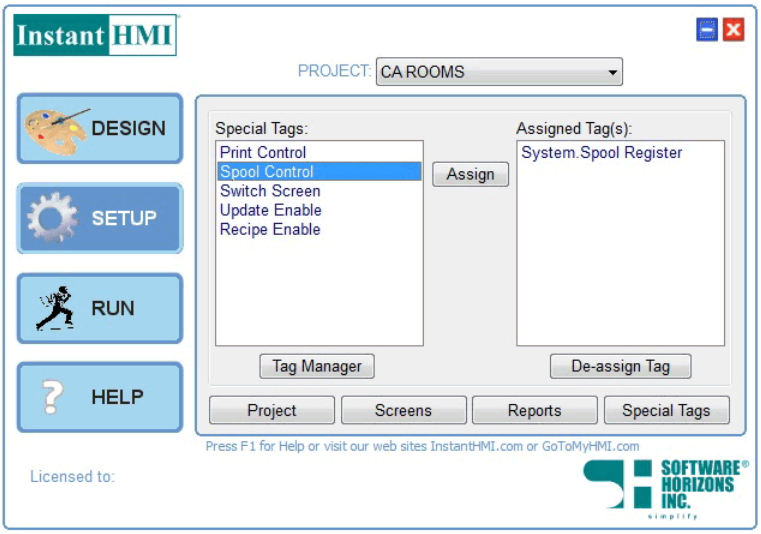

Figure 16-2: Setup → Special Tags (Spool Control)

For example, the tag named 'System Spool Register' is assigned the 'Spool Control' special tag function. To define a special tag, click on the Special Tag function on the left hand panel (Spool Control selected in Figure 16-2) and then click on 'Assign' button. This will invoke the Tag Manager to select or define associated tag(s) from the project tag database to be used to trigger spool reports included in your project. To exclude a tag from the Assigned Tags list click to highlight and select it, and then click on the De-Assign Tag button. To create a new tag (to be assigned for Spool Control), click on the **Tag Manager** button.

At Runtime, the System Spool Register controls the spooling action. For this example, we have setup hourly and daily spooling action in a Runtime script (Section 16.1.4).

16.1.3 Incorporate Report Viewer: Screen Designer → Spreadsheet Viewer

The Spreadsheet Viewer tool allows you to place a Spreadsheet Viewer object on the screen which allows the viewing of data files generated at Runtime. This object is re-sizable. To access the properties dialog for this object, right click on it and select Component Object Properties. (You may also double-click anywhere on the shaded border area of the object, but not inside any of its components such as the display area, pull-down list, Print button, etc.). In the Properties dialog, select File Type (example: CSV), File Name (example, Spool Reports*.S01), and Delimiter (Example: Comma) used in data file to separate fields; these selections help the operator at Runtime to select and view useful data files as needed (*.S01 in our example). You may also set the Viewer Title, Colors for the Title and Data, Column Headings, Grid for display, and include Print button and/or Config button. The Properties shown in the dialog result in the 'Spreadsheet Viewer' as shown.

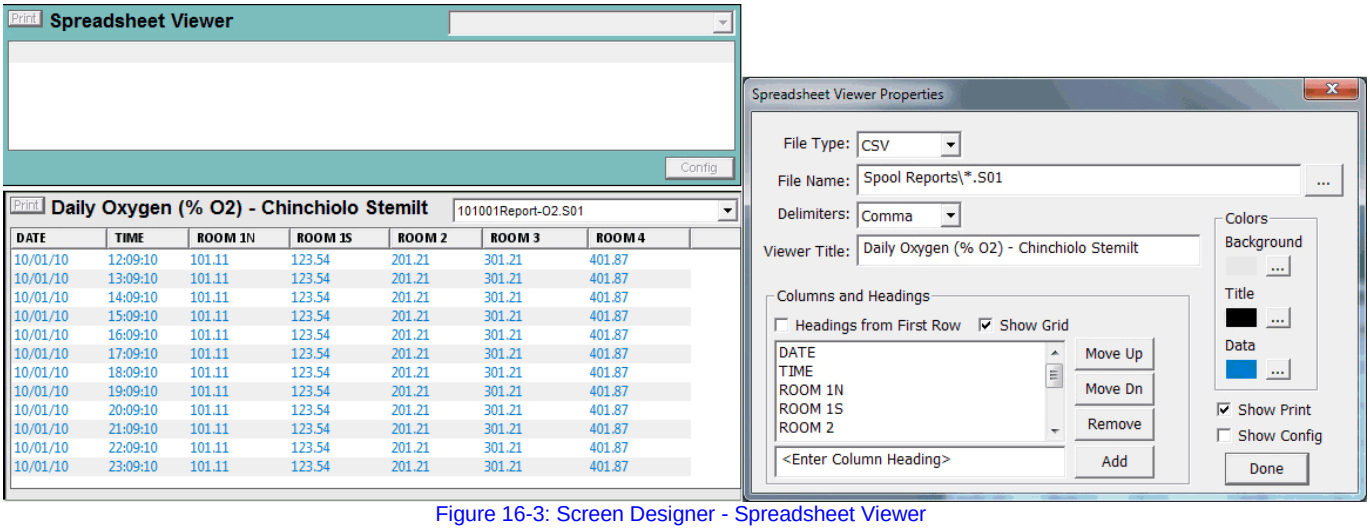

Figure 16-3: Screen Designer - Spreadsheet Viewer

At runtime, the data from the selected file will be displayed in the data display area. From the pull-down menu at the top, the operator can select to view any of the file types pre-selected (*.S01 in our case) at design time. Further, the **Config** button allows the filtered selection of data based on Date (must be column 1, in the format month/date or month/date/year) and Time (must be column 2, in the format hour:min with or without seconds); the **Print** button will print the visible contents of the viewer.

16.1.4 Implement Runtime Script

You can create and edit scripts from within **Screen Designer**. First create a monitor data item to which you wish to attach a Script. Double-Click on the new data object. The Data Display Object dialog will appear. Select a Script from the pull-down list (if it exists). Click on the Edit button for viewing/editing selected script or to create a new script. A dialog entitled “Select Script File” will appear. Click on the Create Script File check box and enter a new script name. Click OK. The Script field will display the script you selected or created.

Runtime.SCT is a special system script (not attached to any object and always available for your project) that gets executed repeatedly (every second or so). In our Reporting example, we use the Runtime script for spooling hourly and archiving daily by appropriate setting of the tag value for the ‘System Spool Register’.

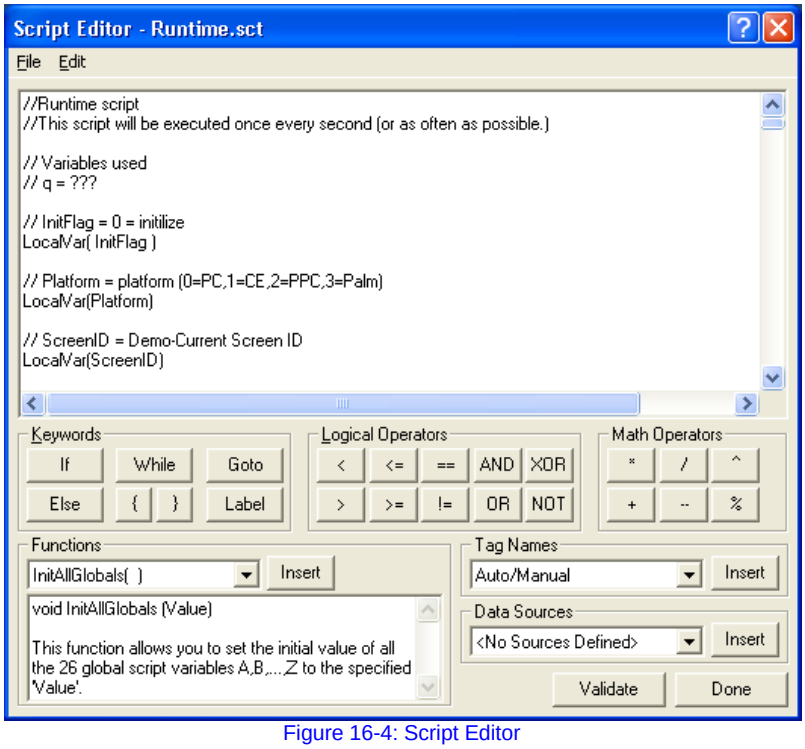

Figure 16-4: Script Editor

```
//Enter Runtime script here
//This script will be executed once every second (or as often as possible.)

LocalVar( sys.init )
LocalVar( sys.hr )
LocalVar( cur.hr )
LocalVar( spl.trigger )
LocalVar( spl.archive )
LocalVar( archive.now )
LocalVar( spl.o2 )
LocalVar( spl.co2 )
LocalVar( spl.temp )
LocalVar( spl.hum )
LocalVar( spl.cur )

spl.o2 = 1
spl.co2 = 2
spl.temp = 3
spl.hum = 4

if( sys.init == 0 )
        {
        sys.init = 1
        sys.hr = 0
        spl.trigger = 0
        spl.archive = 0
        archive.now = 0
        }

cur.hr = GetTag( System.Time.Hour )
if( sys.hr != cur.hr )
        {
        sys.hr = cur.hr
        spl.trigger = 1
        if( cur.hr == 23 )
                {
                spl.archive = 1
                }
        }
```

```
spl.cur = GetTag( System.Spool Register )
if( (spl.trigger == 1) AND (spl.cur == 0) )
        {
        SetTag( System.Spool Register, spl.o2 )
        spl.trigger = 2
        goto :END
        }

if( (spl.trigger == 2) AND (spl.cur == 0) )
        {
        SetTag( System.Spool Register, spl.co2 )
        spl.trigger = 3
        goto :END
        }

if( (spl.trigger == 3) AND (spl.cur == 0) )
        {
        SetTag( System.Spool Register, spl.temp )
        spl.trigger = 4
        goto :END
        }

if( (spl.trigger == 4) AND (spl.cur == 0) )
        {
        SetTag( System.Spool Register, spl.hum )
        spl.trigger = 0
        if( spl.archive == 1 )
                {
                archive.now = 1
                spl.archive = 0
                }
        goto :END
        }

spl.cur = GetTag( System.Spool Register )
if( (archive.now == 1) AND (spl.cur == 0) )
        {
        spl.o2 = 3328 + archive.now
        SetTag( System.Spool Register, spl.o2 )
        archive.now = 2
        goto :END
        }

if( (archive.now == 2) AND (spl.cur == 0) )
        {
        spl.co2 = 3328 + archive.now
        SetTag( System.Spool Register, spl.co2 )
        archive.now = 3
        goto :END
        }

if( (archive.now == 3) AND (spl.cur == 0) )
        {
        spl.temp = 3328 + archive.now
        SetTag( System.Spool Register, spl.temp )
        archive.now = 4
        goto :END
        }

if( (archive.now == 4) AND (spl.cur == 0) )
        {
        spl.hum = 3328 + archive.now
        SetTag( System.Spool Register, spl.hum )
        archive.now = 0
        goto :END
        }

:END x = 0
```

16.1.5 Design Spool Templates

You may use spool report templates along with the spooling capability to print multiple reports (up to 99) to disk concurrently. You may also merge the spooled reports into a single printer report (as well as another spool report) whose template is under your total control. Spooling feature is available on PC, CE and Pocket PC platforms.

For user convenience named spool templates are preferable; but to allow access to spool template files from controller registers numbered template files '#.SPL' (# = 1,2,...,99) are more convenient. Here we describe how you may assign any named spool record template file 'SpoolName.SPL' to act as the numbered template file '#.SPL' (# = 1,2,...,99). In LaunchPad, click on Setup → Reports and then click on the radio button 'Spool'. In the available '(Spool) Report Templates' panel select, for example, Report-CO2.spl. In the 'Assigned (Spool) Report Templates' panel click on 2 (for our example) and then click on the 'Assign >' button. Repeat this with each available spool report that is to be used in the project. Click the Remove button to clear (or reset) a specific assignment.

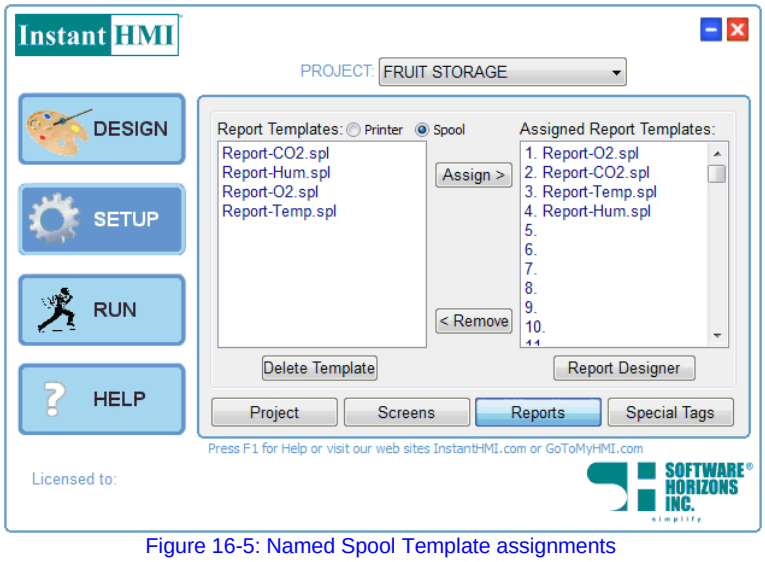

Figure 16-5: Named Spool Template assignments

Note that at runtime, the daily spooled reports will include the spool template file name in addition to the 'YYMMDD' prefix in the name. For example, the spool template file 'Report-CO2.SPL' is assigned slot '2.' and the Spool Register contains the value 3328+2 (i.e., Archive Report-CO2.S02 into file YYMMDDReport-CO2.S02). The Spool Register value 3330 will then cause the spooled report file Report-CO2.S02 to be archived under the name 'YYMMDDReport-CO2.S02 identifying by name the spool template file used in producing the spooled report Report-CO2.S02.

The table shows our example with four .spl files and corresponding assignments and output files.

Spool #	Spool Template File (Comma Separated)	Output Report Files	Archived Report Files
1	Report-O2.SPL	Report-O2.S01	YYMMDDReport-O2.S01
2	Report-CO2.SPL	Report-CO2.S02	YYMMDDReport-CO2.S02
3	Report-Hum.SPL	Report-Hum.S03	YYMMDDReport-Hum.S03
4	Report-Temp.SPL	Report-Temp.S04	YYMMDDReport-Temp.S04

16.1.6 How Does Spooling Work?

Spooling feature in InstantHMI is controlled by a Special Register (the Tag named 'Spool Register' in the Tag Group 'Special Registers' setup in InstantHMI) and is summarized below:

What is done by the PC/InstantHMI
At design time 'Spool Record template' is setup in the spool template file. At runtime the spool register is read to determine appropriate (event driven) action. The operator may also demand spooling action through the runtime Reports → Spool menu. Current data requested in the spool template file is spooled (stored) in a spool report file.

What is done by PLC/Ladder Logic or Runtime Script
Trigger the spooling action (in InstantHMI Runtime) as an event by storing the appropriate value in the Spool Register.

How to set up a Spooling/Data Logging System
Create up to 99 spool template files. Edit the tag 'System.Spool Register' to suit your spool register address and data source. Determine which spooling function you want (example: Archiving - Daily is 3328). Ensure the PLC logic or Runtime script loads the appropriate value into the Spool Register and thus triggers the desired spooling function.

Spool Register Functions

The (16 bit) Spool Register (in our example, 'System.Spool Register') will be interpreted as follows. The low byte (8 bits) in the Spool Register will refer to the spool template file assignment number (1, 2, etc). You may use up to 99 spool template files *.SPL and corresponding assignments. The High byte (8 bits) in the spool register will provide additional functionality as summarized below.

SPOOL REGISTER FUNCTIONS SUMMARY (Register Value = Spool File Assignment Number + Adder)			
		OPTION	ADDER = 256 X OPTION
SPOOLING			
	SPOOL INDIVIDUAL	00	0
	SPOOL DELETE	01	256
	SPOOL AGGREGATE	02	512
ARCHIVING			
	SECONDS	10	2560
	MINUTES	11	2816
	HOURS	12	3072
	DAYS	13	3328
SAVING			
	SECONDS	20	5120
	MINUTES	21	5376
	HOURS	22	5632
	DAYS	23	5888

Figure 16-6: Spool Register Function Summary

Note: You may view the Spool Report in the LaunchPad (while the runtime is running) as illustrated in Figure 5-20.

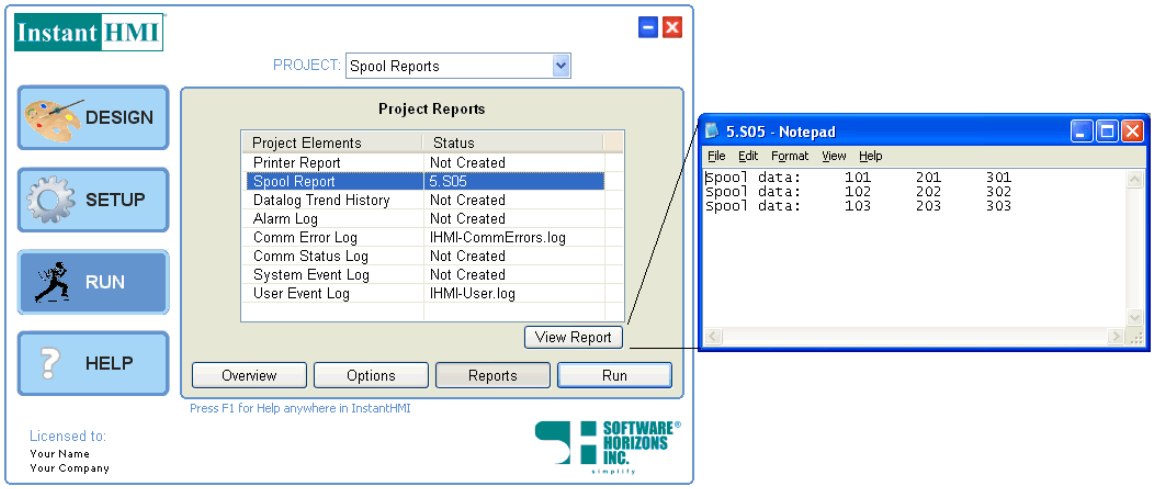

Figure 16-7: Viewing Spooled Report in LaunchPad

Data Logging using Spool Register Functions
You may create up to 99 spool template files *.SPL to define different data record formats (example: Report-O2.SPL).

Use spool template files to save data in disk files every day, hour, minute, or second. The Spool Register triggers the saving of data by its non-zero content (Spool Function). InstantHMI resets the spool register back to zero after performing the required function. The low byte value (1-99) selects one of the assigned spool template files 1-99 for the data record format. The high byte value (20-23) determines the duration for which data continues to be saved in the same file: one Day, one Hour, one Minute or one Second. The saved file names depend on the year YY, day DD, hour HH, minute mm, second ss, and the spool template file.

Example: Datalog into a spool file every hour and Archive daily
The Spool Register has the value 3330 (with high byte value = 13, and low byte value = 2). It causes a data record according to the data format in Report-CO2.SPL to be saved in a daily file (110405Report-CO2.S02) when the date elements are YY = 11, MM = 04, DD = 05 (that is, 4th Apr 2011). Until the time is prior to mid-night on this day, each time the Spool Register contains the value 2, a new data record according to the template in Report-CO2.SPL will be appended to the spool report file Report-CO2.S02.

At mid-night, the Runtime.sct script will set the Spool Register value to 3330, which flushes the Report-CO2.S02 file to the archive file 110405Report-CO2.S02.

Creating Reports at Runtime

Using Reports → Print Menu at Runtime
Use the Reports → Print command to print a report on the printer. The report printed will correspond to the screen displayed on the monitor. That is, if you are looking at screen 2 and use the Print command then report 2.PRT (or the report assigned to printer report slot 2) will be printed. Of course, the format and content of the report is totally flexible and determined by you. Note that using the SPOOL command in conjunction with the PRINT command the operator can produce totally different reports to suit diagnostic or other special needs.

Using Reports → Spool Menu at Runtime
If you click on Report → Spool menu choice when you are looking at screen 2 at runtime the effect is same as setting the spool register Upper Byte = 00, Lower Byte = 2. The Runtime Engine will add a data record according to the template 2.SPL (or the spool report assigned to spool report slot 2) in the spool report file SPOOL.S02.

16.2 Reporting Task: Implementation using Task Scheduler

We illustrated in Section 16.1 the five steps needed in creating Hourly spool reports, archiving the reports Daily, and have the capability to view archived reports using the Spreadsheet Viewer in the Runtime. The same Reporting Task is implemented here using the Task Scheduler and involves the following steps:

- Create spool template files *.SPL
- Assign spool template files to specific spool number slots
- Incorporate Spreadsheet Viewer in a runtime screen
    - Configure Spreadsheet Viewer
    - Create Column Headings
- Schedule a Task to perform desired spooling action
    - Create 'Periodic' task for hourly spooling
    - Create 'Daily' task for daily archiving

16.2.1 Assign Spool Templates: LaunchPad → Setup → Reports

This step for Task Scheduler is same as Section 16.1.1.

16.2.2 Create Spool Register Tag: LaunchPad → Setup → Special Tags

This step is not required in the Task Scheduler implementation.

16.2.3 Incorporate Report Viewer: Screen Designer → Spreadsheet Viewer

This step for Task Scheduler is same as Section 16.1.3.

16.2.4 Implement Runtime Script

This step is not required in the Task Scheduler implementation, which is a major advantage. It is replaced by a much simpler step discussed below (Section 16.2.6).

16.2.5 Design Spool Templates

This step for Task Scheduler is same Section 16.1.5.

16.2.6 Schedule Tasks to Spool and Archive Reports

Step 1: Access Task Scheduler Tool
In LaunchPad when you click on Design → Screens, you will see 'Tasks' listed as a Screen Element.

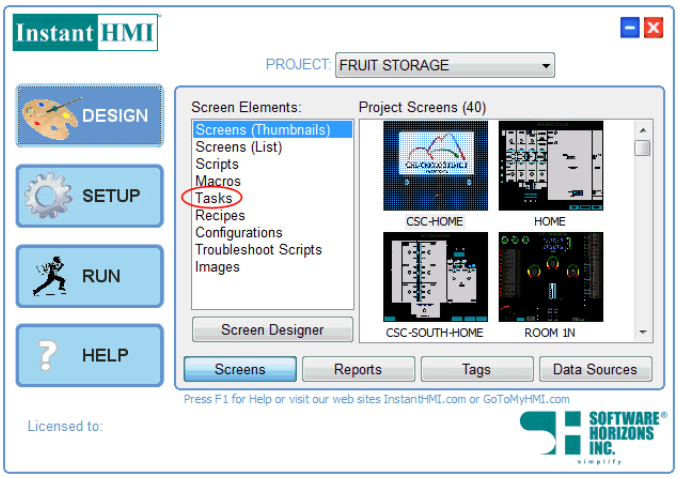

Figure 16-8: Design → Screens → Tasks

Click on Tasks → Task Scheduler button to access the 'Task Scheduler' Tool/Utility. This Tool allows you to define and schedule tasks and save the results in the database IHMI-ScheduleDB.idb. If there are any tasks defined you will see them listed in the Task Scheduler dialog. In our example, there are no tasks defined and the list is empty.

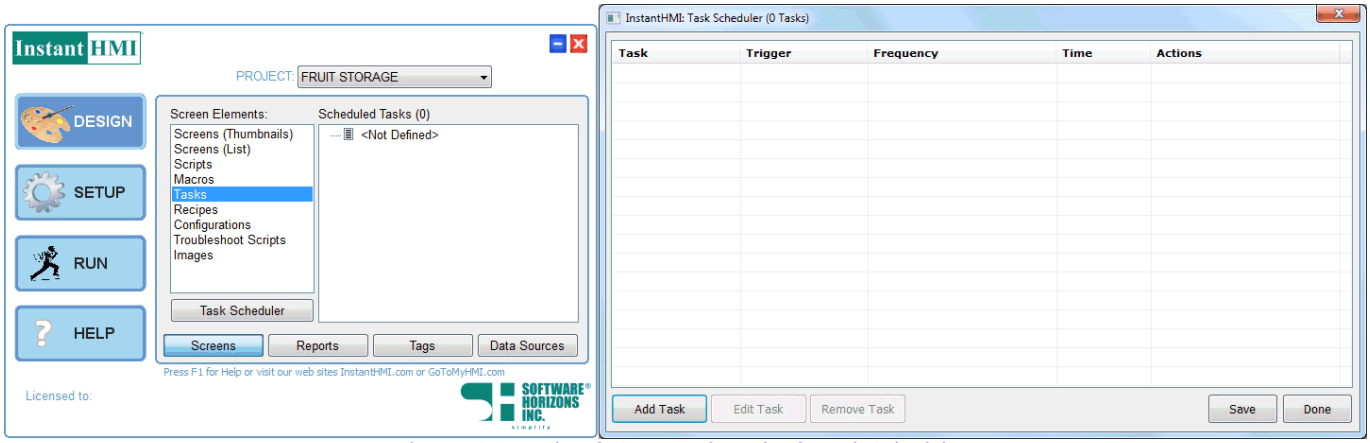

Figure 16-9: Design → Screens → Tasks → Task Scheduler

Step 2: Define a Task (Example: 'Spool O2 Report' every minute)
Click 'Add Task' to define and schedule a new task. You will see the 'Task Schedule' dialog. Each task you define may have the following elements: Task Name, Trigger Frequency, Actions, and when to End Task.

The **Trigger Frequency** in a Task Schedule may be Periodic: Daily, Weekly, Monthly, Yearly or as defined by you (Repeated Every HH:MM:SS).

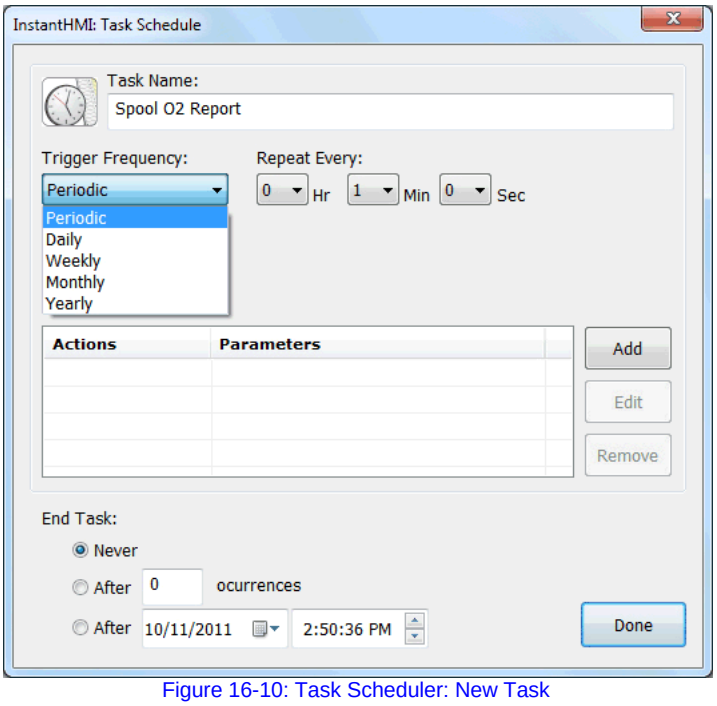

Figure 16-10: Task Scheduler: New Task

You enter the Actions to take when the defined task triggers. Click on Add button to select action(s) associated with task. The available actions are: Print Report, Spool Report, Execute Macro, Execute Script and several other Spooling Actions (Spool Aggregate, Spool Archive, Spool Save, and Spool Delete) . The selected Action may require a Parameter selection (for example, Spool Report requires a template file name such as "Report-O2.spl" as shown).

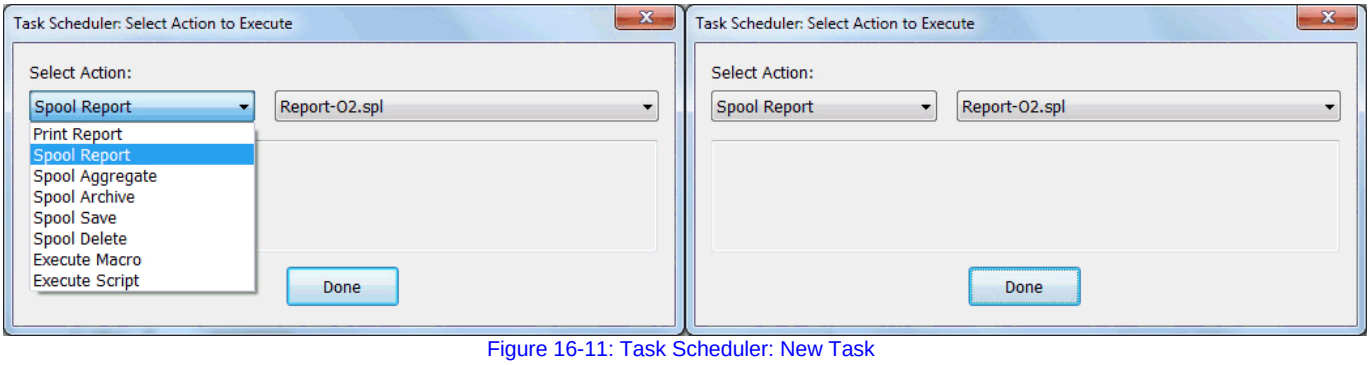

Figure 16-11: Task Scheduler: New Task

Click 'Done' to finish the definition of the Scheduled Task and any associated Actions. You will see all action definitions displayed in the Task Schedule dialog box. Click on Done button to return to the Task Scheduler, where you will see all scheduled tasks listed. You may access the Task Scheduler anytime as follows: LaunchPad → Design → Screens → Tasks →Task Scheduler and then review all scheduled tasks.

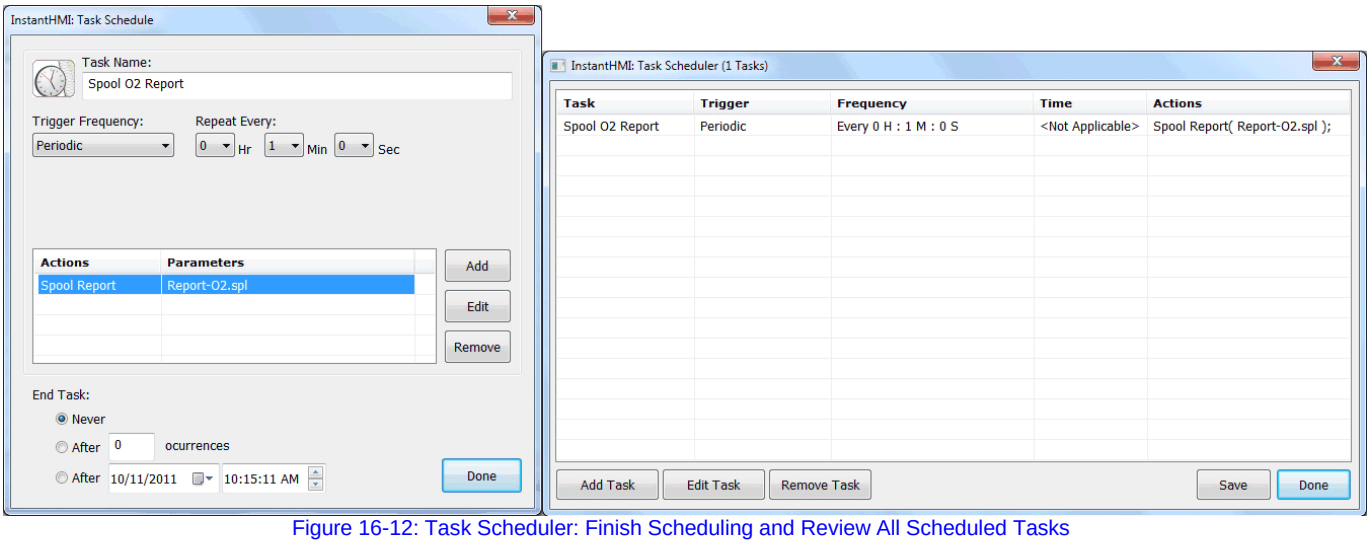

Figure 16-12: Task Scheduler: Finish Scheduling and Review All Scheduled Tasks

Step 3: Define Other SpoolingTasks (Example: 'Spool CO2/Temperature/Humidity Report')

For our example, we setup three other tasks similar to 'Spool O2 Report' as shown in the Task Scheduler dialog.

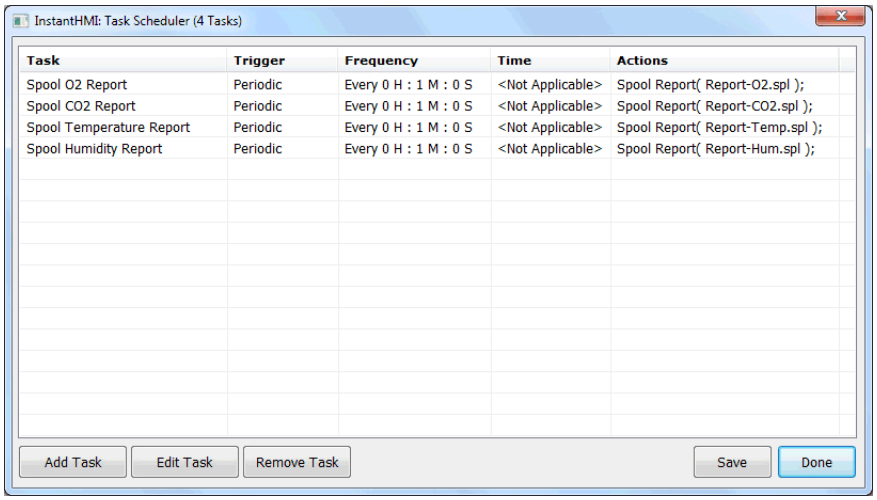

Figure 16-13: Task Scheduler: Setup Spool for other reports

Step 4: Define ArchivingTask (Example: 'Archive O2 Report' Daily)

This Step is similar to Step 2. The Trigger Frequency is 'Daily' with 'Everyday' checked. Trigger Time is 1 minute before mid-night (11:59:00 PM). The Action is 'Spool Archive' the spool template 'Report-O2.spl'. Schedule daily spool report archive task.

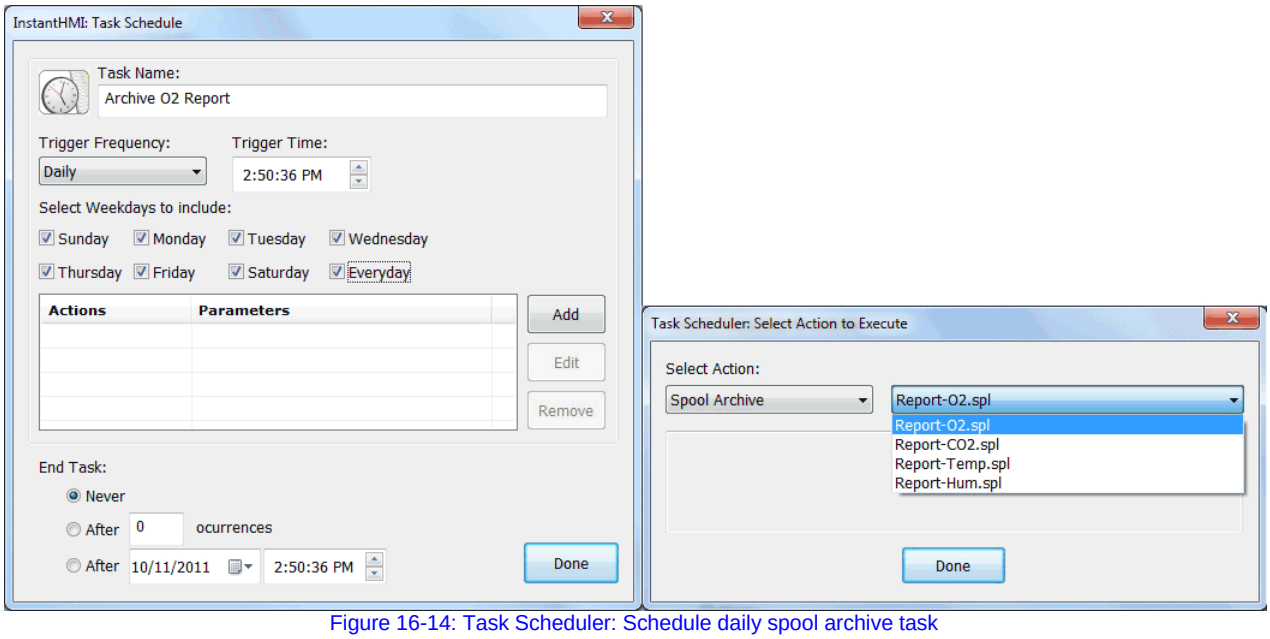

Figure 16-14: Task Scheduler: Schedule daily spool archive task

Click on Done button to finish defining the task: 'Spool Archive - Daily and repeat forever'.

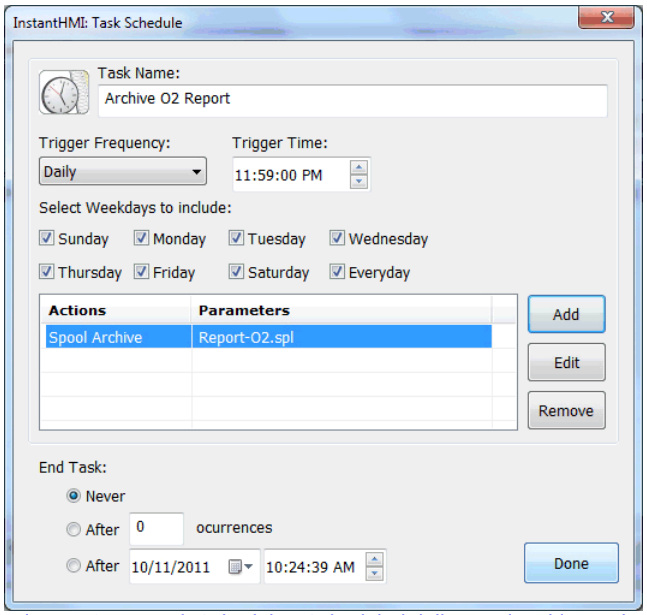

Figure 16-15: Task Scheduler: Scheduled daily spool archive task

Step 4: Define Other ArchivingTasks (Example: 'Archive CO2/Temp/Humidity Report' Daily)

Repeat the above procedure for all remaining tasks and then review all the scheduled Spooling and Archiving Tasks in the 'Task Scheduler'.

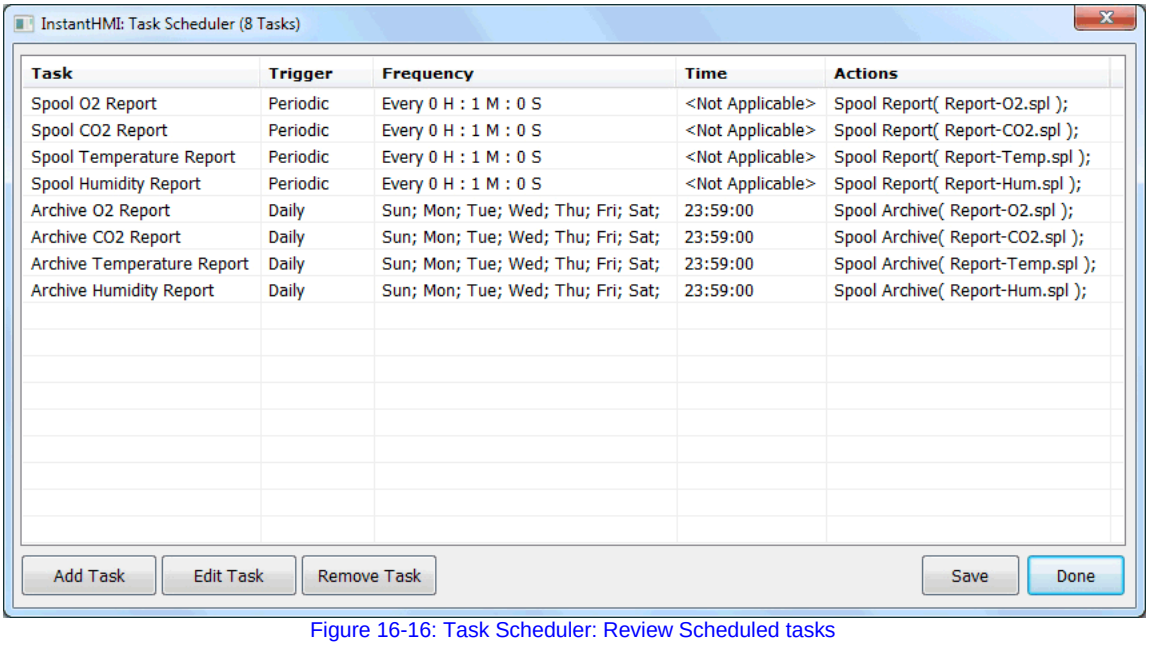

Figure 16-16: Task Scheduler: Review Scheduled tasks

Click on Done in the Task Scheduler to return to the LaunchPad and see all scheduled tasks in LaunchPad Designer.

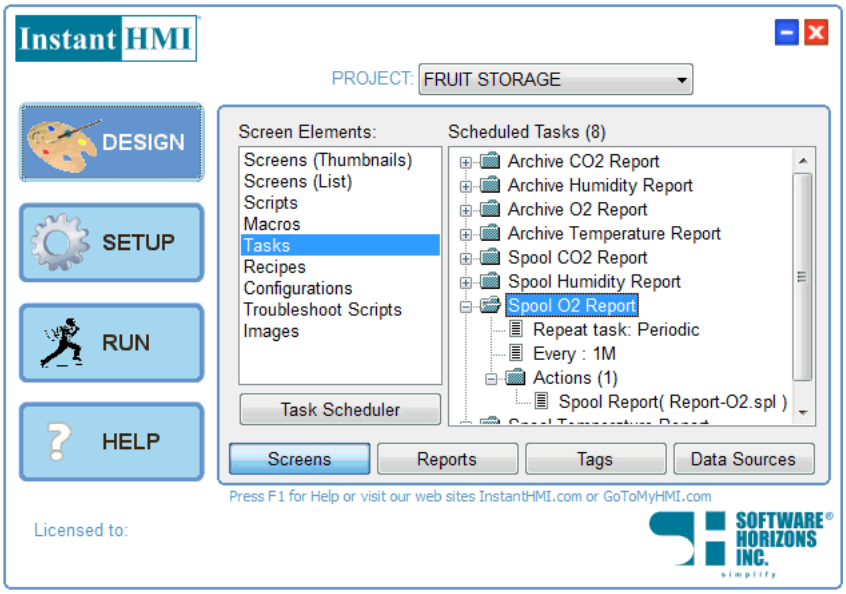

Figure 16-17: Task Scheduler: Review Scheduled tasks in LaunchPad Designer

16.3 Task Scheduler Makes Reporting Task Easy

The Task Scheduler simplifies complex tasks that otherwise may require writing elaborate scripts as illustrated by the implementation of the Reporting Task: hourly spooling and daily archived reports.

17 Alarm Management

17.1 Overview

InstantHMI 6.1 supports Alarm Management Features compatible with ANSI/ISA - 18.2 - 2009 standards. Reference Source: We highly recommend the excellent book published by ISA in 2011: “Alarm Management”, by authors Bill Hollifield and Eddie Habibi. This is a regulatory standard that applies to all processes and systems although it has a built-in grand father clause for existing systems. At Design time Tags can be configured for alarms including priority, zone, etc. At Runtime, the operator can view only selected alarms by filtering alarms according to priority and zone, and then acknowledge individually or in groups. All transitions into and out of alarm states, along with operator acknowledgements and missed acknowledgements, are logged and the logged alarm history can also be viewed and printed.

The objective of alarm configuration is to inform the operator, help him determine the root cause and take corrective actions in a timely manner. In addition, there is a need to avoid 'Alarm Floods' to reduce operator ‘Work Load’ as well as help retain his trust in the alarm system. We illustrate here the steps needed in properly configuring alarms for tags, include the alarm reports in a Daily Log, and have the capability to view archived alarm logs using the Alarm and Event Viewer in the Runtime. The following tasks are involved in designing your project to accomplish the stated objective:

- Configure Alarms for selected tags from Tag database (Section 17.3.1)
- Assign Annunciation options for configured alarms (Section 17.3.2)
- Create Scripts for any special action sequence for alarm response (Section 7)
- Review alarms at Runtime using Alarm Viewer (Section 17.5)

17.2 Alarm Database

When you click on the Design →Tags button in LaunchPad, you will see a selection for the Alarm Database for the selected project. On the right hand panel, you will see a list of Tags that are configured for Alarms, that is, ‘Alarmed Tags’ (Figure 17-1).

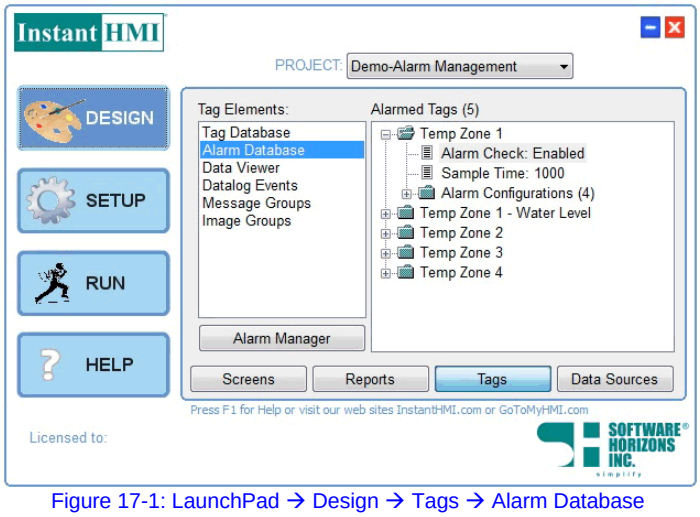

Figure 17-1: LaunchPad → Design → Tags → Alarm Database

The Alarm Database stores for each alarmed tag a record of all the alarm configurations, and for each configuration a record of all annunciations. The alarm configuration parameters Priority, Condition, Type, Setpoint, Dead Band, On Delay, Off Delay, Annunciations and Message are described below.

17.2.1 Alarm Priority

There are two important considerations while configuring an alarm:

- How severe are the consequences?
- Is there a threat to life or bodily injury?
- Are there very high economic losses?
- How much time does the operator need to perform corrective action?
- If the operator misses an alarm the associated consequence will occur.

Based on these considerations it is possible to assign priorities to the configured alarms. Six priorities are available in InstantHMI for alarm configuration, as listed below:

Priority	Description	Guidelines
P0	Critical	Recommended for life threatening and/or severe High cost consequences
P1	Urgent	Recommended for alarm condition that must be acted upon within a limited time window to avoid injury or very high cost consequence
P2	Serious	Recommended for alarm condition that must be acted upon within a reasonable time window to avoid very high or high cost consequence
P3	Important	Recommended for alarm condition that must be acted upon within a reasonable time window to avoid moderate cost consequence
P4	Alerts	Recommended for alarm condition that must be acted upon within a longer time window to avoid low/moderate cost consequence
P5	Events	Recommended for logging data to analyze causes leading to more serious or important alarm conditions

In a properly configured systems there will be very few Critical Alarms (P0), and the alarms of higher priorities (P1 and P2) will not be more than about 5% of all configured alarms. The important alarms (P3) will not be more than about 15% of all configured alarms. Bulk of the alarms, about 80%, will be of the alert priority (P4). (Note: Local Memory 3091 – 3099 contain useful alarm information – See Section 3.3.4)

When the alarms configured for your process/system does not meet these guidelines, then you can perform ‘Alarm Documentation and Rationalization’ to document, analyze and re-configure alarms over a period of weeks/months and accomplish the desired objectives. Alarm Rationalization is the systematic process of optimizing the alarm database for the safe and efficient operation of the facility. This will also avoid 'Alarm Floods' (more than 10 alarms occurring in a ten minute interval) , reduce operator ‘Work Load’ and help retain operator trust in the alarm system.

At Runtime the operator may filter alarms by Priority and/or Zone. In addition, the displayed alarms may be sorted by Priority (by clicking on the ‘P?’ tab heading).

17.2.2 Alarm Zone

It may be helpful to assigning specific Zone # to various alarm configurations so that at Runtime the operator may filter alarm by one or more selected zones. For example, all flows may be assigned to Zone 1, pressures to Zone 2 and Temperatures to Zone 3. Alternatively, all alarm configured tags which are meant for a specific operator’s responsibility may be assigned a specific Zone #. The assignments may be made to suit the specific application and operator roles defines in a specific plant setup.

At Runtime the operator may filter alarms by Priority and/or Zone. In addition, the displayed alarms may be sorted by Zone (by clicking on the ‘Zone’ tab heading).

17.2.3 Alarm Condition

Five different alarm conditions are available, while configuring an alarm, as tabulated below:

Condition Label	Criterion based on Tag Value (TV) and Setpoint (SP)	Remarks
High High	TV >= SP.HH	Dead Band, On-Delay, Off-Delay may be included.
High	TV >= SP.H	
Low	TV <= SP.L	
Low Low	TV <= SP.LL	
Range	TV <= SP.L or TV >= SP.H	

To illustrate, a Tag will be in High alarm condition if it satisfies the criterion TV >= SP.H; that is, the associated tag value (TV) is greater than or equal to the High Alarm Setpoint (SP.H). If Dead Band is specified (non-zero), then the Tag is in High alarm condition if TV >= (SP.H + Dead Band) and Tag returns to normal if TV <= (SP.H - Dead Band). To avoid alarm chatter, an On-Delay (seconds) may be specified; in this case, the alarm condition is annunciated only if it persists beyond On-Delay (seconds). Likewise, an Off-Delay (seconds) may be specified; in this case, the alarm condition is reset to normal only if it stays normal for at least Off-Delay (seconds).

At Runtime the operator may filter alarms by Priority and/or Zone. In addition, the displayed alarms may be sorted by Condition (by clicking on the 'Condition' tab heading).

17.2.4 Alarm Type

Similar to Zone, it may be helpful to assign a specific Type to various alarm configurations; four types are provided for convenience:

System
Process
User
Undefined

At Runtime the operator may filter alarms by Priority and/or Zone. In addition, the displayed alarms may be sorted by Type (by clicking on the 'Type' tab heading). Alarm Type may be useful to direct operator attention to relevant set of actions for remediation of that specific alarm condition.

17.2.5 Alarm Setpoint

One or more Alarm Setpoint parameters are used in the criterion to evaluate a defined alarm condition and perform the annunciation action. See Section 17.2.3.

17.2.6 Alarm Dead Band

The purpose of Dead Band is to avoid alarm chatter, that is, the tag variable under consideration entering and leaving alarm condition repeatedly over a short period of time without operator intervention. Alarm chatter may occur, mostly due to process noise. See Section 17.2.3.

The typical dead band parameters based on tag variable signal type are: 5% for Flow or Level measurements, 2% for Pressure measurements and 1% for Temperature measurements. Dead Bands may be applicable only to tags representing analog variables.

17.2.7 Alarm On Delay

The purpose of On Delay Timer is similar to Dead Band in that this parameter helps avoid nuisance alarms due to noise or transients. With On Delay timer, the alarm is annunciated only if the alarm condition persists after the timer elapses. See Section 17.2.3. The timer values are typically 15 – 30 seconds.

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17.2.8 Alarm Off Delay

The purpose of Off Delay Timer is similar to Dead Band in that this parameter helps avoid nuisance alarms due to noise or transients. With Off Delay timer, the alarm annunciation is turned off only if the alarmed tag's return to normal condition persists after the timer elapses. See Section 17.2.3. The timer values are typically 15 – 60 seconds.

17.2.9 Alarm Annunciations

Several options are available to annunciate the alarms to get the operator's attention:

- Blink Object on screen at a specified rate
- Play System Beep for specified time period
- Play Sound File from a specified file
- Execute Script from specified script file
- Execute Macro corresponding to specified macro key
- Send Email to specified addresses

At Runtime, when the operator acknowledges an alarm, the corresponding alarm annunciations will be 'silenced' and no longer will distract the operator (by competing for his attention). The operator may also 'Suppress' nuisance alarms so there will be no need to repeatedly acknowledge them.

17.2.10 Alarm Message

Any configured alarm may be assigned an Alarm Message to be displayed to the operator at Runtime when the specified alarm condition occurs. For example, when a High Alarm configured for a tag variable 'Zone 1 Temperature' occurs, the operator may be shown the following message:

"Zone 1 too Hot - Turn on Coolant Pump"

The Alarm Message is setup by the system designer to inform/assist the operator at runtime.

17.2.11 Alarm Annotation

At Runtime, while handling an alarm condition, if an operator desires to 'annotate' a specific alarm occurrence, he may do so by entering his annotation remarks. Such remarks will be recorded for the benefit of other operators and flagged in the 'Annotated?' field with the indication 'Yes'. The operator may double click on that field to view the relevant annotations as shown in the example below:

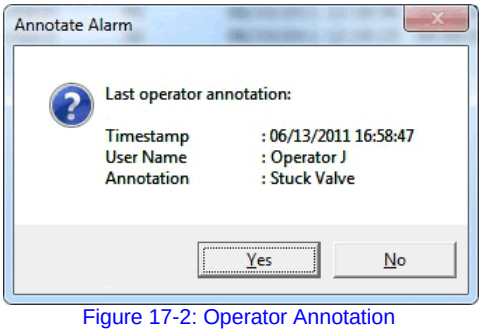


Figure 17-2: Operator Annotation

Alarm Annotation accepts operator comments as input (when he decides to Suppress or Annotate a selected alarm condition) so that it may be used in improving the alarm management, setting priorities etc.

17.3 Alarm Manager

The Alarm Manager allows to you to configure alarms for tags. You can access the Tag Editor from the Screen Designer as follows: click on Tag Data → Tag Data Base to open the Tag Database

dialog, select any Tag Name (example: Temp Zone 1) and click on Tag Editor (or double click on Tag Name). You will see the Tag Editor dialog (Figure 17-3), which shows the number of Alarm Configurations (4 in our example) for the selected tag. Here click on Alarm Manager button to review and manage the Alarm Configurations for the tag (Temp Zone 1 shown in Figure 17-4).

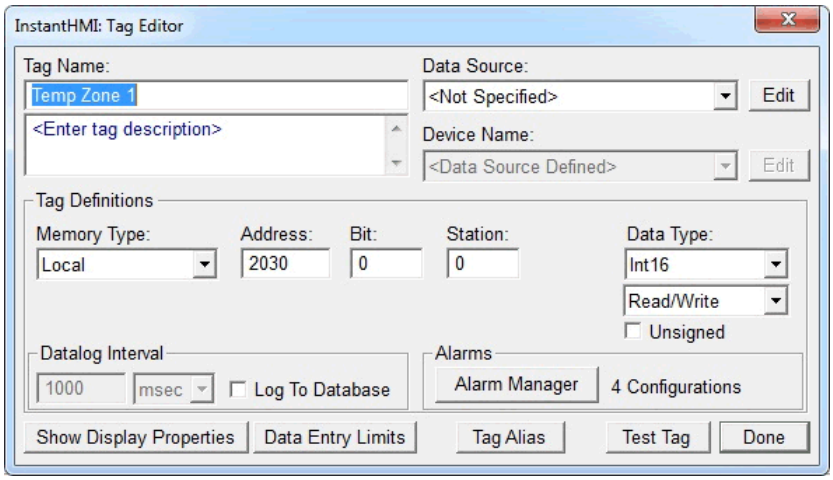


Figure 17-3: Tag Editor showing Alarm Configurations

Note: In LaunchPad you may also click on the Design →Tags → Alarm Database → Alarm Manager button to access the Alarm Manager, which allows you to review the Alarm Database defined for your project (Figure 17-4). You may also access Alarm Manager from Screen Designer by clicking on Tag Data → Alarm Manager menu option.

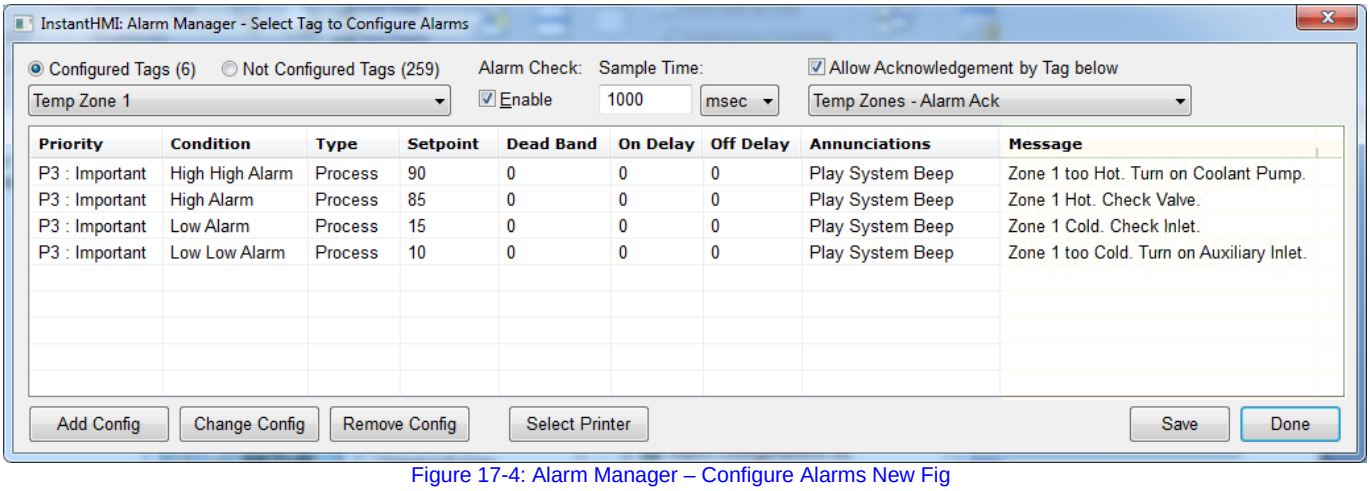


Figure 17-4: Alarm Manager – Configure Alarms New Fig

For details of Alarm Configuration see Section 17.3.1 and Alarm Annunciation see Section 17.3.2. When you are finished specifying all alarm configuration parameters click on the Done button in the Alarm Configuration dialog. This will return you back to the Alarm Manager dialog, where you will see the alarm configuration you just added for the selected tag. Click on Save button to save the alarm configurations to the Alarm Database.

Repeat the alarm configuration process for any other tag(s) for which you desire to configure alarms. Finally, click on Done button to exit the Alarm Manager dialog and return to the LaunchPad, where you will see an overview of all the 'Alarmed Tags' (Figure 17-1). Note: In Alarm Manager the up/down arrow keys can be used to scroll through the alarm tag names. Also you may change alarm sample time from alarm manager.

17.3.1 Alarm Configuration

In the Alarm Manager you can select from two groups of tags:

- 'Configured Tags', are tags previously configured for alarms

- 'Not Configured Tags' are tags for which alarms are yet to be configured

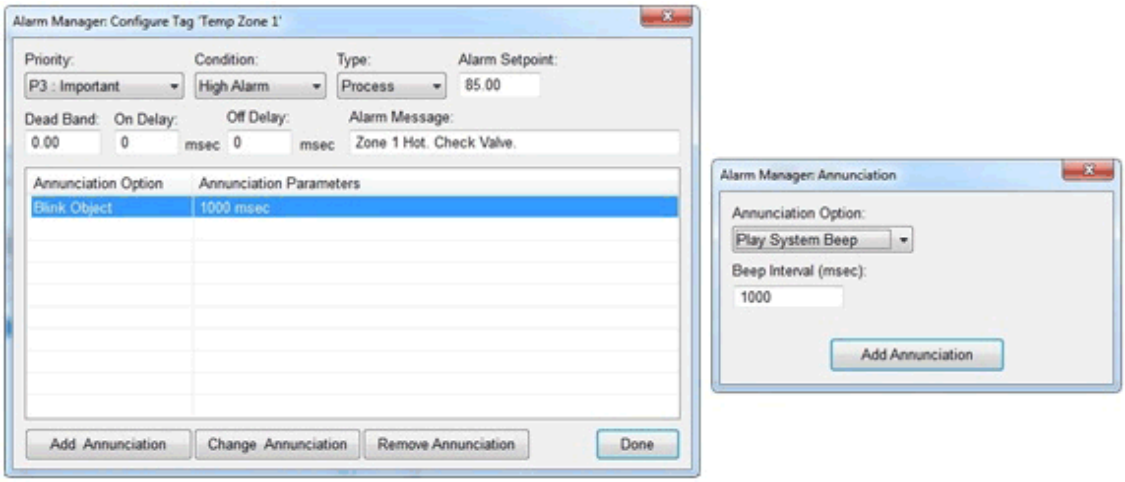


Figure 17-5: Configure Alarm and its Annunciation(s)

Once 'Configured Tags' is selected, you can view the existing alarm configuration(s) for any configured tag, by selecting it on the pull-down list. You will see all its alarm configuration parameters: Priority, Condition, Type, Setpoint, Dead Band, On Delay, Off Delay, Annunciations and Message. These parameters are described in Section 17.2. For any configured tag, which has been configured for an alarm previously, select (highlight) a configuration by clicking on the configuration. You may perform the following actions by clicking on one of the three function buttons provided:

- 'Add Config', to add a new configuration to existing configurations (Figure 17-5)
- 'Change Config', to change the selected configuration (Figure 17-5)
- 'Remove Config', to remove the selected configuration

Note: You may also disable all defined configurations for a tag by un-checking the 'Alarm Check Enable' check box at the top of the Alarm Manager dialog (Figure 17-4).

17.3.2 Alarm Annunciation

Once you have configured the alarm, you are ready to specify one or more ways of annunciating the alarm to the operator. In the Configuration dialog (Figure 17-5), click on 'Add Annunciation' button to pop-up the Annunciation dialog. Here you can select the Annunciation Option and enter any required parameter (example: Play System Beep at Beep Interval of 1000 msec).

Annunciation Option	Parameter
Blink Object	Blink Rate (Seconds)
Play System Beep	Beep Interval (msec)
Play Sound File	Sound File
Execute Script	Script to Execute
Execute Macro	Macro to Execute
Send Email	Email Address Group
Print Alarm	[Date] [Time] [Tag Name] [Tag Value] [Alarm Condition] [Alarm Message]

Blink Object for Alarm Annunciation
The screen object associated with the tag that is alarm condition will be highlighted by a box surrounding it that will blink at the rate specified.

Play System Beep for Alarm Annunciation
When the tag is in alarm condition, the computer beep sound will play repeatedly at the interval specified.

Play Sound File for Alarm Annunciation
When the tag is in alarm condition, the computer will play the specified sound file once. In alarm manager, browse button allows you to select sound file. Playing sound file in alarm condition would

not affect runtime performance. (Sound files must be in the InstantHMI installation folder for PPC/CE Runtimes.)

Execute Script for Alarm Annunciation
When the tag is in alarm condition, the runtime will execute the script specified. The actions taken will depend on how the script is designed. You can create and edit scripts using the Script Editor (Section 7).

Execute Macro for Alarm Annunciation
When the tag is in alarm condition, the runtime will execute the macro specified. The actions taken will depend on how the macro is designed. You can create and edit macros using the Macro Editor (Section 6).

Send Email for Alarm Annunciation
When the tag is in alarm condition, the runtime will send email to the specified group of email addresses in the Contact Database. The generation of the email is governed by the Email Configuration Parameters (Section 7).

Print Alarm
When the tag is in alarm condition, the runtime will send an alarm log record setup by you ([Date] [Time] [Tag Name] [Tag Value] [Alarm Condition] [Alarm Message]) to the specified printer (selectable at Runtime by Operator).

17.3.3 Email Configuration and Contact Database

In LaunchPad click on Design → Data Sources, and select Email Configuration. Click on Email Configuration button to access the Email Configurations dialog.

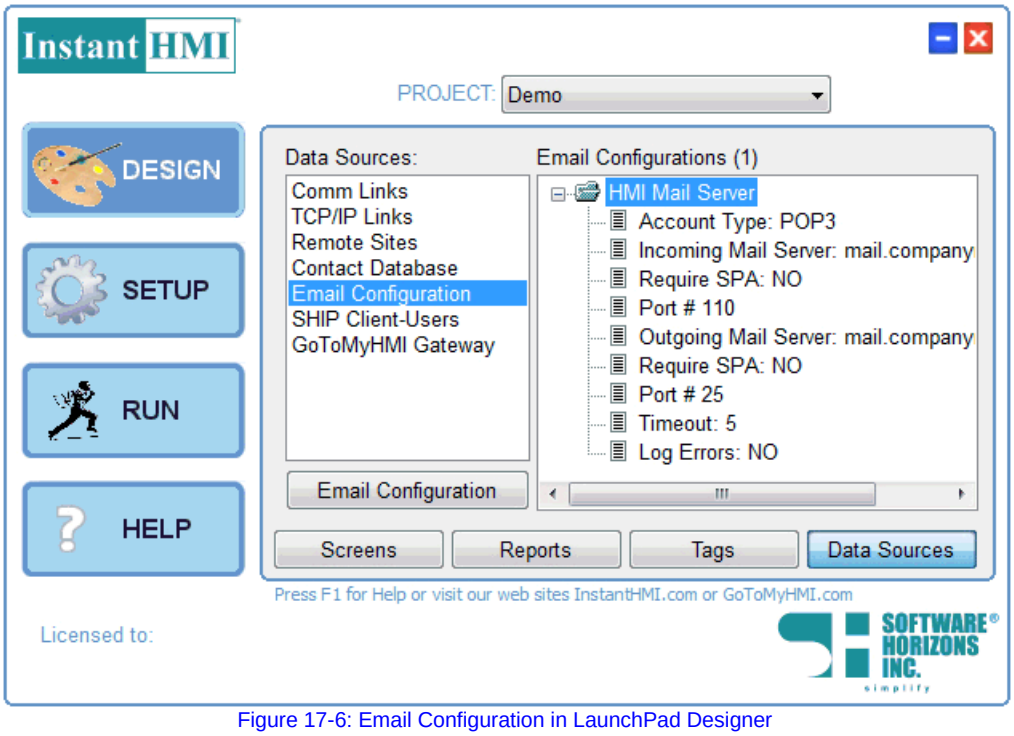


Figure 17-6: Email Configuration in LaunchPad Designer

Click on 'Add Config' button to open the Email Configuration dialog, where you can enter all the Email Configuration Parameters for each Email Account Name you create. The parameters include Account Type, Outgoing Mail Server, Incoming Mail Server, Server Timeout etc. A sample filled in dialog is shown here. Note: You should enter information to suit your own Email setup (for example: SSL may be required). Click on Done after entering all the required Email Configuration Parameters.

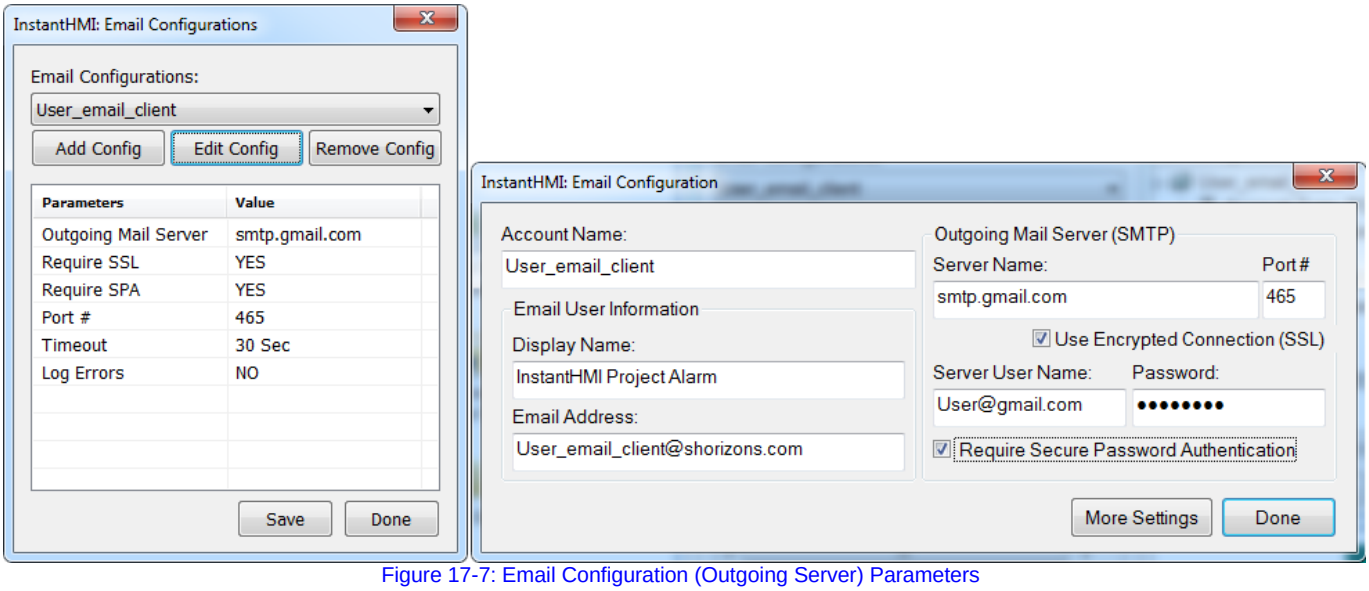


Figure 17-7: Email Configuration (Outgoing Server) Parameters

If you are satisfied with the displayed Email Configuration Parameters for the account name 'HMI Email Server' then click on Save. If you have no more configurations to add click on Done. You will return to the LaunchPad, which now shows the one Email Configuration 'User_email_client' you created.

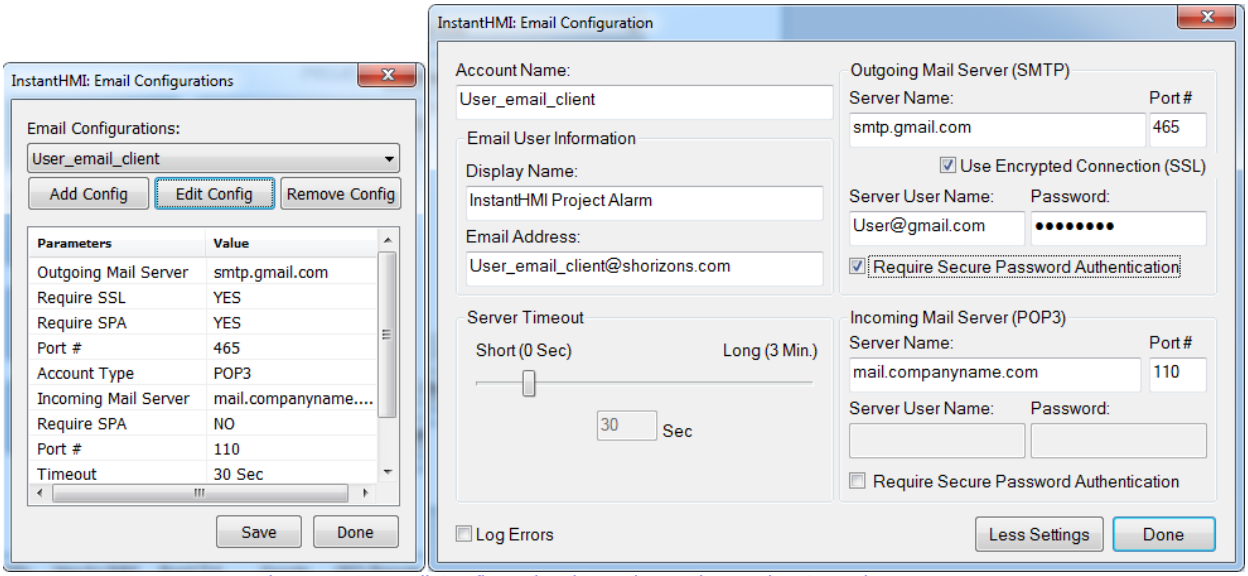


Figure 17-8: Email Configuration (Outgoing and Incoming Server) Parameters

In LaunchPad click on Design → Data Sources, and select Contact Database. Click on Contact Database button to access the Contact Management dialog.

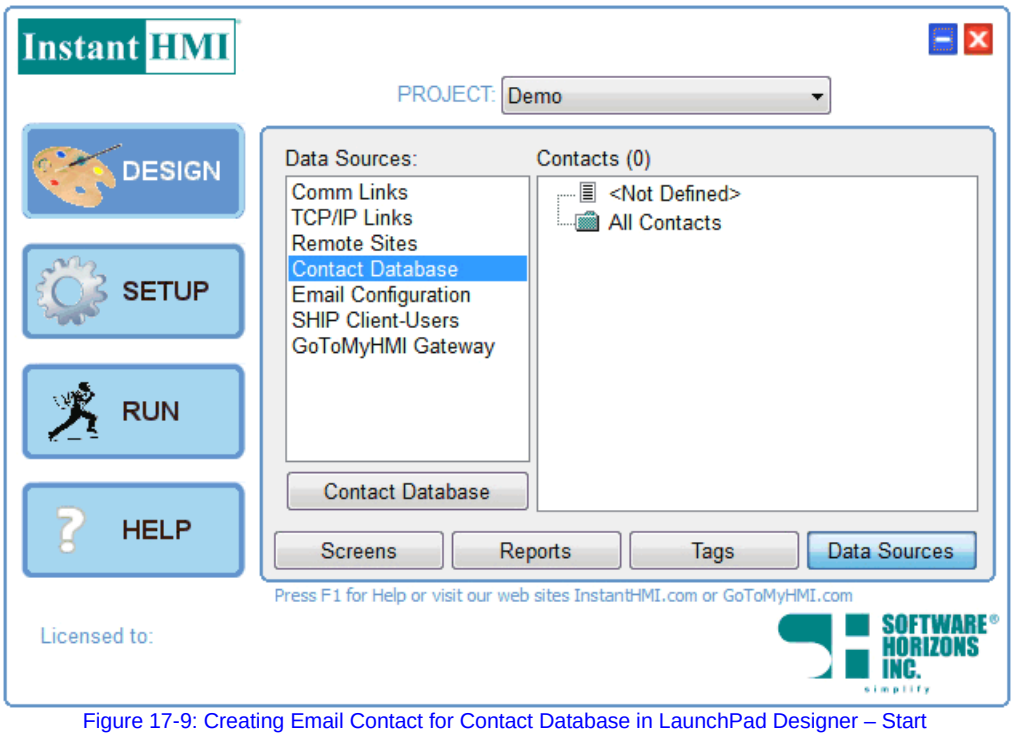


Figure 17-9: Creating Email Contact for Contact Database in LaunchPad Designer – Start

To start with, the Contact Database is empty, that is Total Contacts in 'All Contacts' group is 0. Click on 'Add' button to create a Contact Group (Operators, in our example). Select the 'Operators' group and click on 'Add Contact' to add Operator 'John K Doe' as shown. In our example, the 'Operators' group has two contacts: John K Doe and Mike Williams.

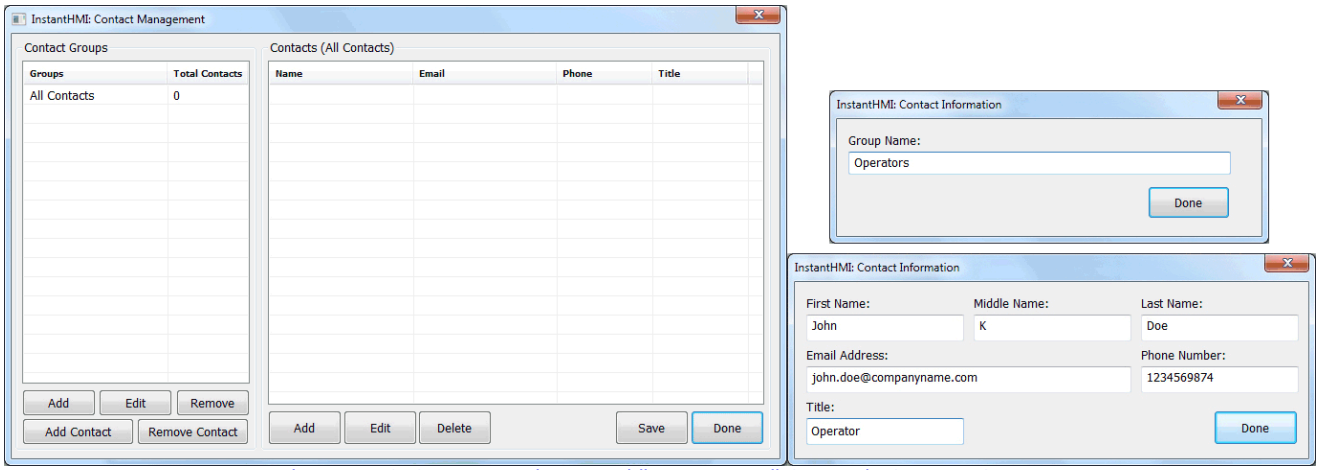


Figure 17-10: Contact Database – Adding New Email Contact in Operator Group

Create all Groups and Email Contacts for each Group as required. Click on Save to save the Contact Database and click on Done when finished creating all Contacts and Groups. In our example, there are a total of 3 contacts: 2 Operators (John K Doe and Mike Williams) and one (Will Smith) from the Engineering Dept.

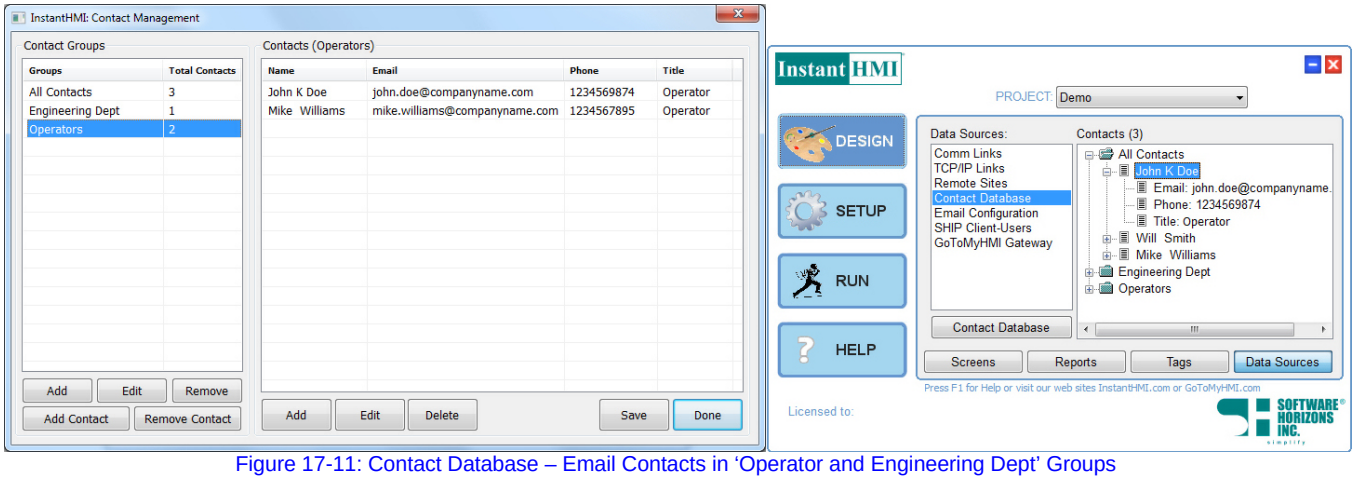


Figure 17-11: Contact Database – Email Contacts in 'Operator and Engineering Dept' Groups

As stated before, when the tag is in alarm condition, the runtime will send email to the specified group of email addresses in the Contact Database IHMIContactsDB. The generation of the email is governed by the Email Configuration Parameters. Runtime email errors are logged in IHMI-EmailServerLogs.log file.

17.4 Export/ Import Alarm Configurations

Alarmed tags in the Tag Database (IHMI-TagDB.idb) have their Alarm Configurations saved in the Alarm Database (IHMI-AlarmsConfigDB.idb); the two databases are linked by the (unique) TagName field for each tag. The Export/Import functions in the Tag Manager are used to Export/Import Alarm Configurations as well.

17.4.1 Export Alarm Configurations

The Demo project, where Temp Zone 1 tag in the tag group bearing the same name (Temp Zone 1) has been configured for alarms, is used for illustrating Alarm Configuration Export/Import functions.

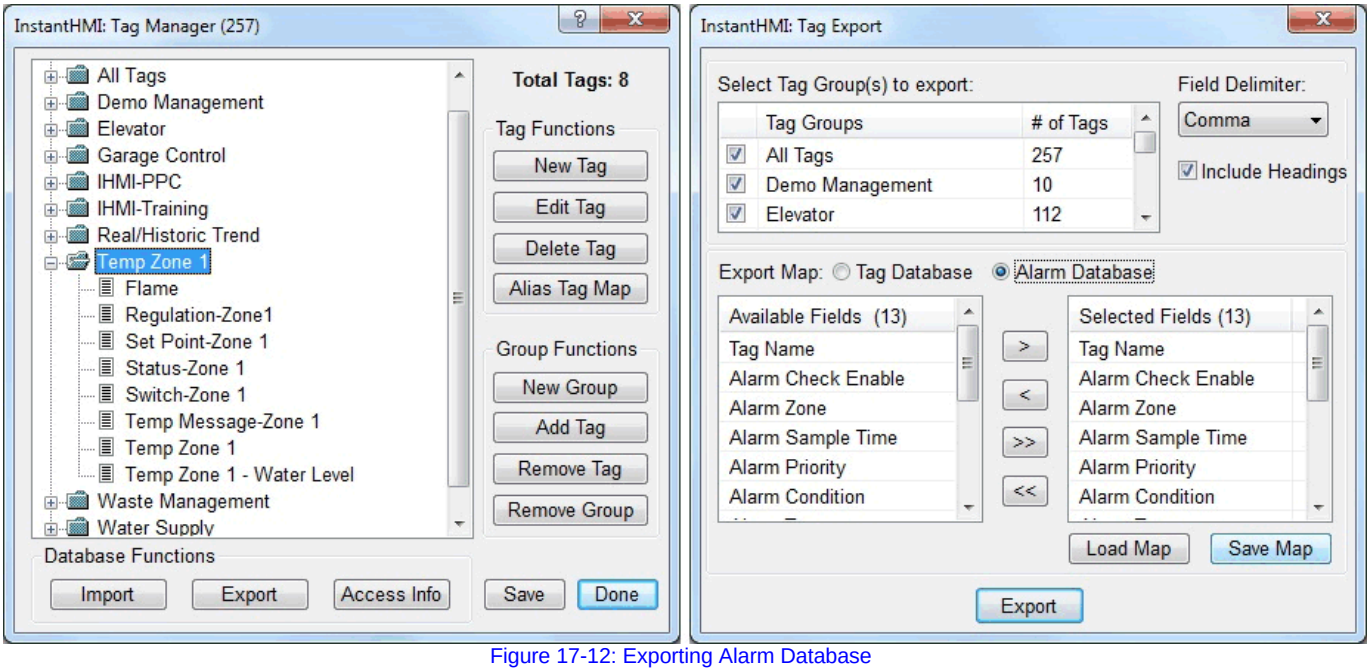


Figure 17-12: Exporting Alarm Database

In Tag Manager open the Tag database for the project (in our example: Demo project). Click on Export button. In the Tag Export dialog, select the Tag Group 'All Tags', check 'Include Headings', and the Export Map for 'Alarm Database'. This default Export Map, selects all the 13 'Available Fields' from the Alarm Database (on the left) and maps them 1-for-1 to the 13 'Selected Fields' (on

the right). You may remove any 'selected field' by clicking on it in the right column and clicking the '<' button. You may remove all 'selected fields' by clicking on the '<<' button. If you choose to create your own Export Map, click on the Save Map button and give your Map a suitable file name (*.map, so it can be used later to Load Map while importing back to the Alarm Database. Finally, click on the Export button. You will see the 'File Save As' dialog, where you enter the export file name (example: IHMI-AlarmExport.csv) and click on the Save button.

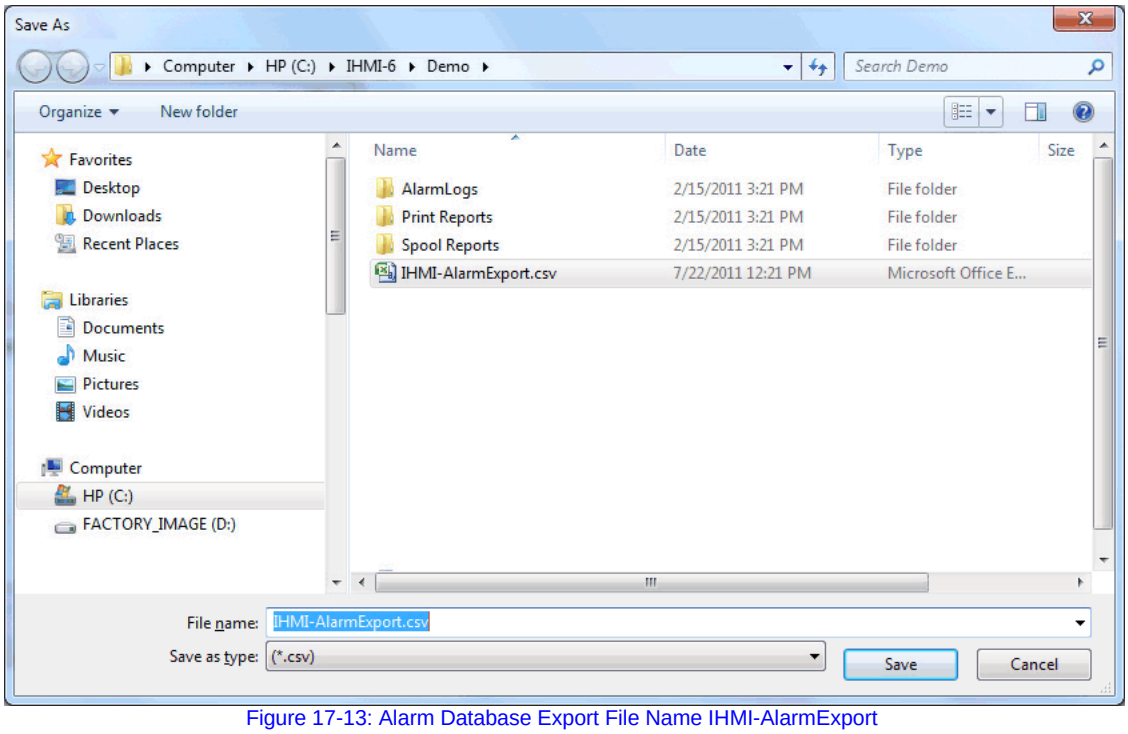


Figure 17-13: Alarm Database Export File Name IHMI-AlarmExport

17.4.2 Import Alarm Configurations

In Tag Manager open the Tag database for the project (in our example: Demo project). Click on Import button. In the Tag Import dialog, select the File to Import as 'Alarm Database' and Field Delimiter as 'Comma' and then click on the Browse button.

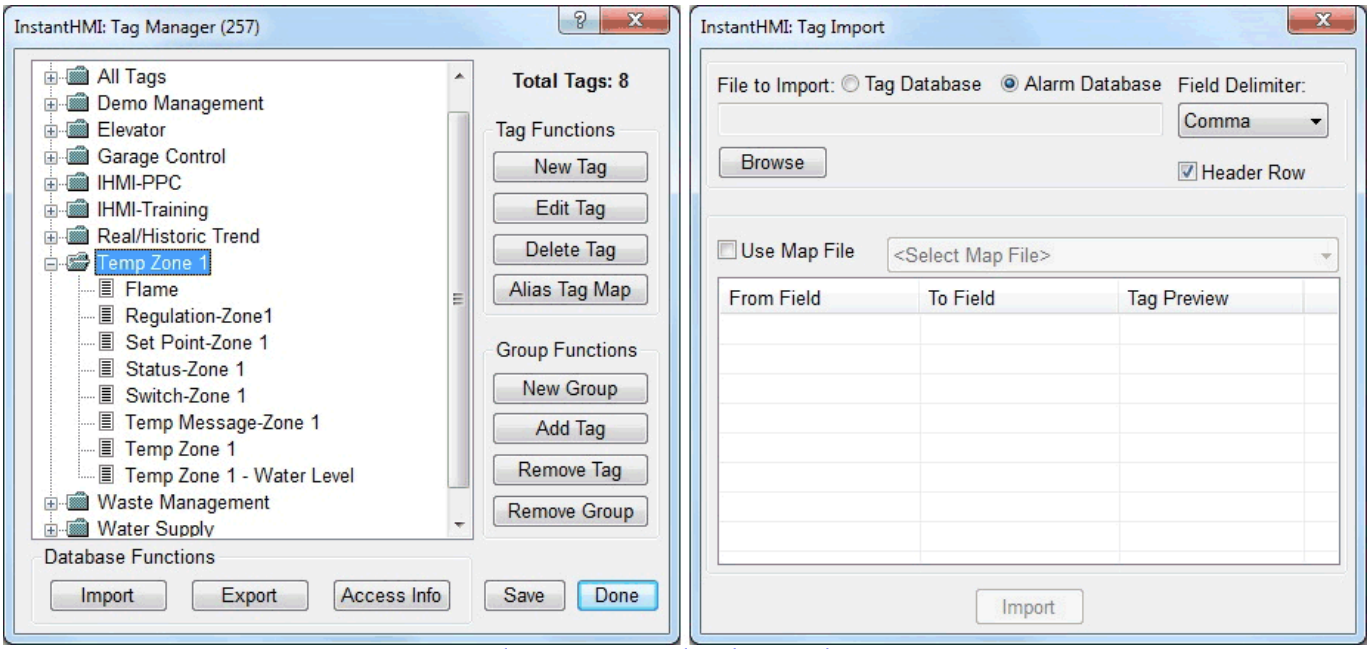


Figure 17-14: Importing Alarm Database

The File Open dialog appears, where you select the import file name (example: IHMI-AlarmExport.csv) and click on the Open button.

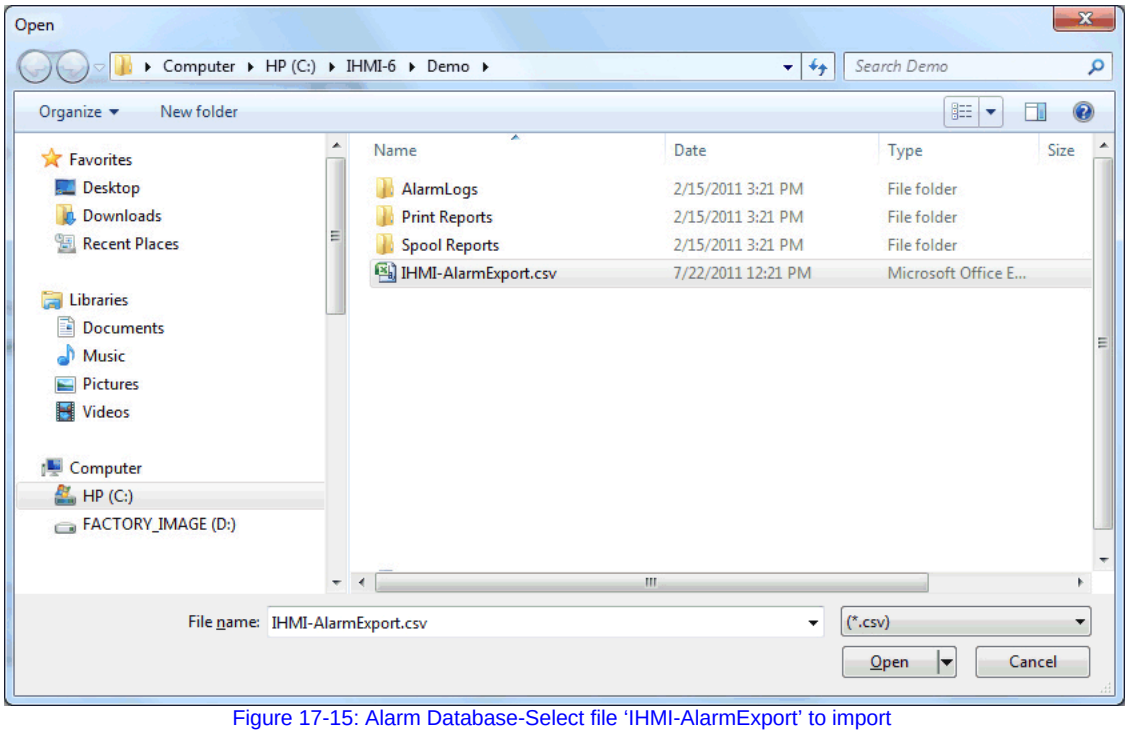


Figure 17-15: Alarm Database-Select file 'IHMI-AlarmExport' to import

The Tag Import dialog appears, where the 'From Field' column is populated from the import file Header Row . The 'To Field' column headings are matched where possible (to the standard Alarm Database field names) otherwise left blank. Click on blank field name and select the target field name desired from the displayed pull-down list. Alternatively, you may 'Use Map File' that you have saved in an earlier export operation. Click on Import button when finished assigning all fields.

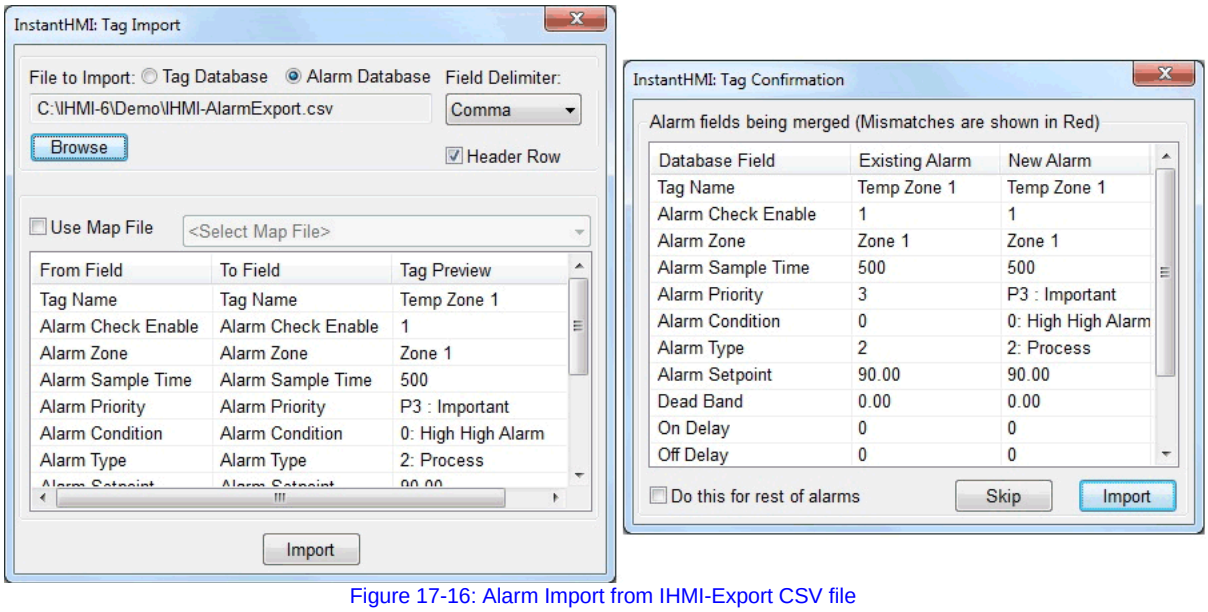
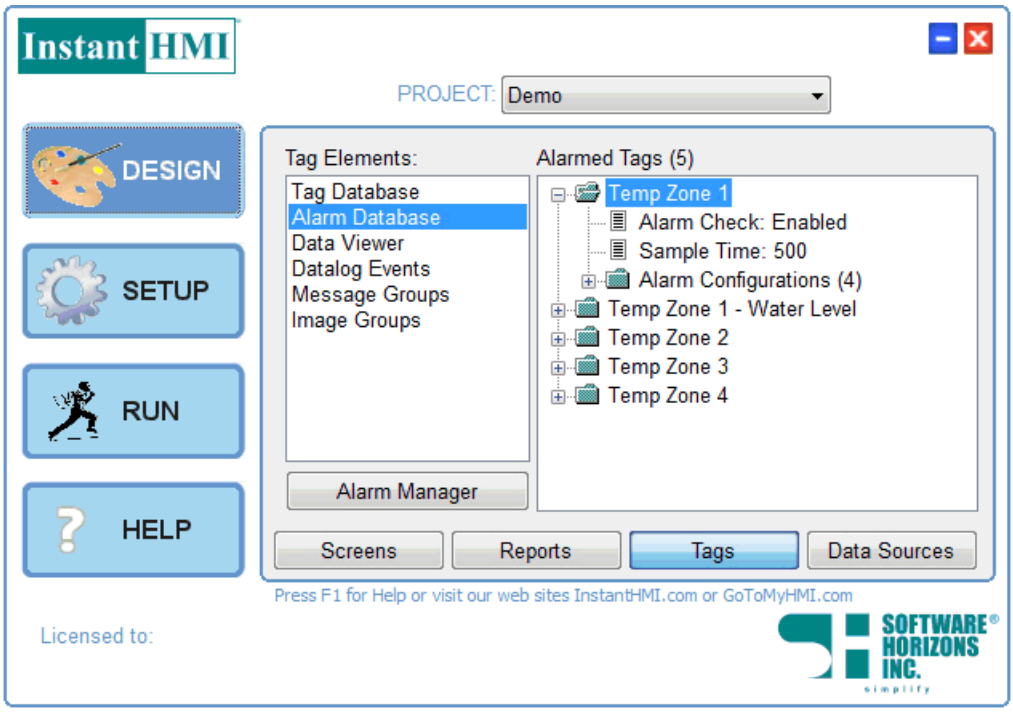

InstantHMI: Tag Import
File to Import: Tag Database Alarm Database Field Delimiter:
C:\IHMI-6\Demo\IHMI-AlarmExport.csv
Comma
Browse
Header Row
Use Map File
<Select Map File>
From Field | To Field | Tag Preview
Tag Name | Tag Name | Temp Zone 1
Alarm Check Enable | Alarm Check Enable | 1
Alarm Zone | Alarm Zone | Zone 1
Alarm Sample Time | Alarm Sample Time | 500
Alarm Priority | Alarm Priority | P3 : Important
Alarm Condition | Alarm Condition | 0: High High Alarm
Alarm Type | Alarm Type | 2: Process
Import
InstantHMI: Tag Confirmation
Alarm fields being merged (Mismatches are shown in Red)
Database Field | Existing Alarm | New Alarm
Tag Name | Temp Zone 1 | Temp Zone 1
Alarm Check Enable | 1 | 1
Alarm Zone | Zone 1 | Zone 1
Alarm Sample Time | 500 | 500
Alarm Priority | 3 | P3 : Important
Alarm Condition | 0 | 0: High High Alarm
Alarm Type | 2 | 2: Process
Alarm Setpoint | 90.00 | 90.00
Dead Band | 0.00 | 0.00
On Delay | 0 | 0
Off Delay | 0 | 0
Do this for rest of alarms
Skip
Import

Figure 17-16: Alarm Import from IHMI-Export CSV file

Note: If Alarms were defined in the Tag Database previously (before this Alarm Database import) then you will see a Tag Confirmation dialog where unmatched Alarm Configuration Field data will be indicated in Red. After reviewing the 'mis-matches' click on Import to confirm the import of this alarm configuration or click on Skip. Proceed to 'Do this for rest of alarms' to complete the import of the Alarm Database. You will return to the Tag Manager dialog, where you click Done to save the updated Tag database and Alarm Database. You will return to the LaunchPad Designer as shown.



17-17: LaunchPad Showing Alarmed Tags (5) After Import of Alarm Database is Complete

17.5 Alarm Viewer in Runtime

At Runtime, each alarmed tag will be evaluated to determine and/or update its alarm state. Whether an Alarm Viewer Object is incorporated on the screen or not, the operator may choose to display the Alarm & Event Viewer dialog (by using the menu item 'Alarms' – if menu bar is invisible, right clicking pops-up the menu items). The Runtime logs a Time line of events and alarms in an Alarm Log. The sequence of events during an alarm occurrence is as follows: Alarm activation → operator detection (and Ack) → operator Action to perform → time in which to perform the action, etc. The Runtime also records the event 'un-Acked' (if the Operator is unable to Ack within some allowed time. (Also see Section 4.6.7, Alarm Viewer Object.)

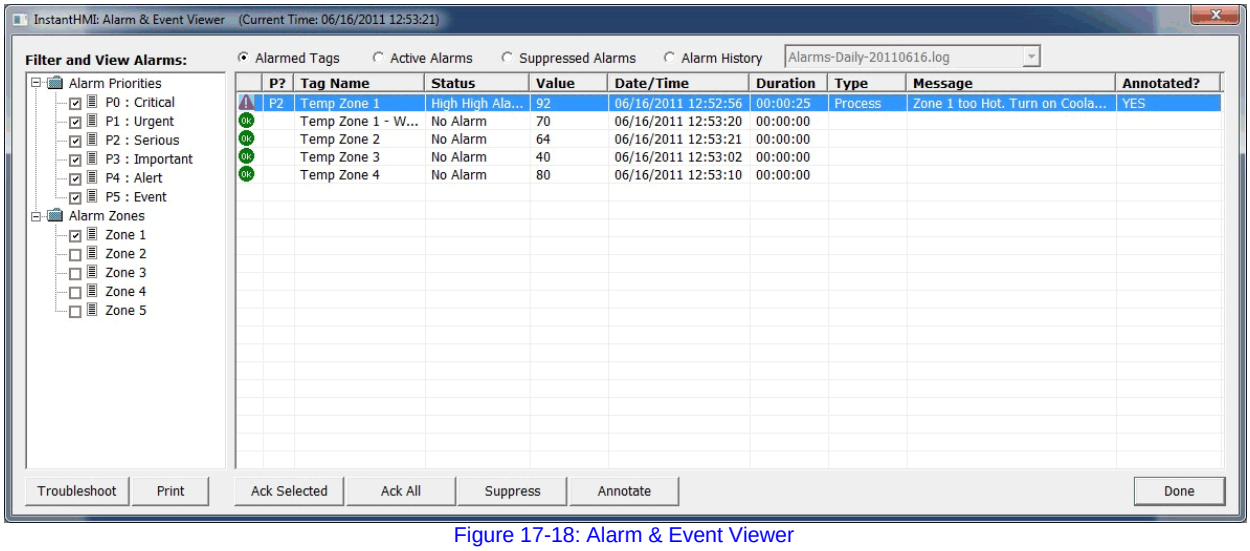

InstantHMI: Alarm & Event Viewer (Current Time: 06/16/2011 12:53:21)
Filter and View Alarms:
Alarm Priorities
P0 : Critical
P1 : Urgent
P2 : Serious
P3 : Important
P4 : Alert
P5 : Event
Alarm Zones
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Alarmed Tags
Active Alarms
Suppressed Alarms
Alarm History
Alarms-Daily-20110616.log
P? Tag Name Status Value Date/Time Duration Type Message Annotated?
P2 Temp Zone 1 High High Ala... 92 06/16/2011 12:52:56 00:00:25 Process Zone 1 too Hot. Turn on Coola... YES
Temp Zone 1 - W... No Alarm 70 06/16/2011 12:53:20 00:00:00
Temp Zone 2 No Alarm 64 06/16/2011 12:53:21 00:00:00
Temp Zone 3 No Alarm 40 06/16/2011 12:53:02 00:00:00
Temp Zone 4 No Alarm 80 06/16/2011 12:53:10 00:00:00
Troubleshoot
Print
Ack Selected
Ack All
Suppress
Annotate
Done

Figure 17-18: Alarm & Event Viewer

The Alarm & Event Viewer dialog has several built-in functions to assist the operator as described below.

17.5.1 Filter and View Alarms

If the number of alarms displayed is too numerous then operator may filter alarms by Priority and Zone to view only the desired alarms. Note: In a plant with multiple operator stations with clearly demarcated alarm handling responsibility, it may be convenient to assign unique Zone # to each operator station. Then filtering by zone will enable the operator to use filtering to view only the alarms meant for his zone.

17.5.2 Acknowledging Alarms

The Operator may Acknowledge alarms individually or in groups by selecting them in the view and clicking the 'Ack Selected' button. He may also use the 'Ack All' button to acknowledge all alarms in the view.

Note: Starting with version 6.1.31 B4002, you may 'Acknowledge Alarm by an associated Tag' (See Figure 17-4). When the associated tag value is set (non-zero) the tag in alarm condition is acknowledged. A single tag may be used to acknowledge alarms for many tags.

Alarm Acknowledgment is thus doable through a Tag. You can configure a momentary Push Button & assign the acknowledgement tag to this Push Button. If you are using multiple independent operator stations (Runtime) connected to your system, and if an alarm occurs, it is not necessary to access each of the Operator Stations, open Alarm Utility & acknowledge the alarm. By using an associated alarm ack tag, all the alarms on all the operator stations will get acknowledged by pressing a soft button on the screen.

17.5.3 Annotating Alarms

The Operator may Annotate any selected alarm by clicking on the 'Annotate' button. This will pop-up 'Annotate Alarm?' dialog, which displays the previous annotation details to alert the operator of any known information for that alarm condition. If he decides to add his own annotation, he may do so by clicking on the Yes button and then entering his new Annotation.

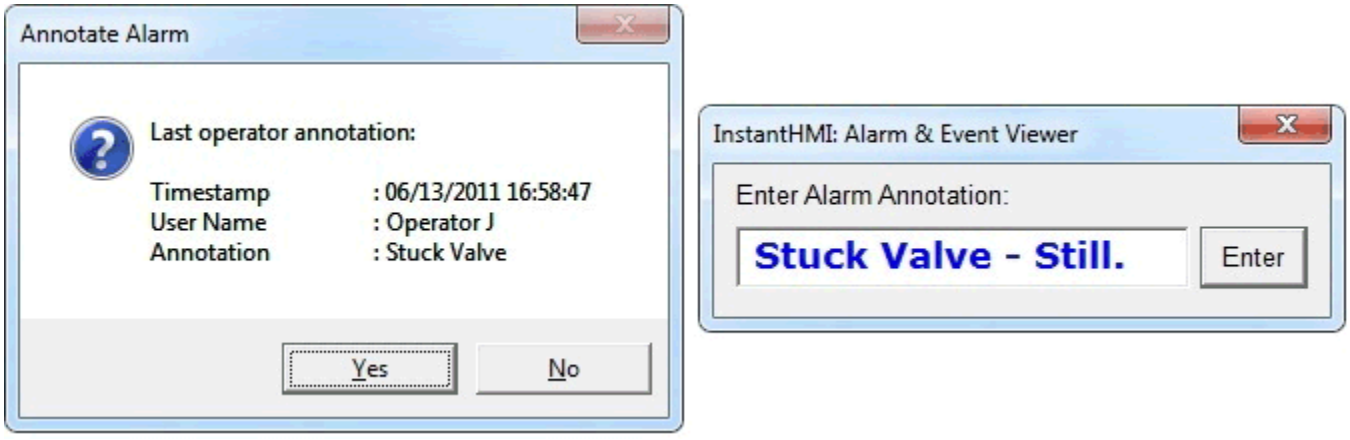


Figure 17-19: Last Operator Annotation Displayed before Entering New Annotation

17.5.4 Suppressing Alarms

The Operator may Suppress any 'nuisance alarm' by selecting the alarm and clicking on the 'Suppress' button. This will pop-up 'Suppress Alarm Configuration' dialog, which displays the previous annotation details to alert the operator of any known information for that alarm condition. If he decides to add his own annotation, he may do so by clicking on the Yes button and then entering his new Annotation (Figure 17-19). If he decides not to suppress the alarm, he may click on Cancel.

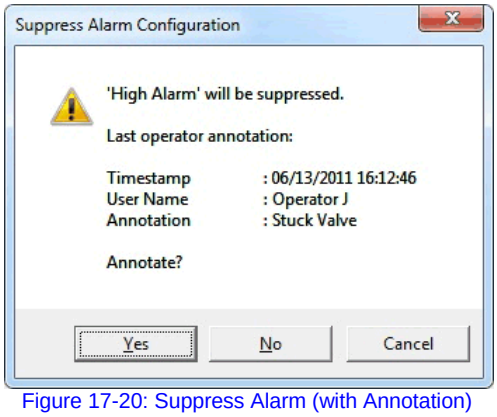


Figure 17-20: Suppress Alarm (with Annotation)

17.5.5 Viewing and Printing Alarm Logs

Operator may select and view any Log of Alarms and Events, view alarm history, and print alarm records.

17.5.6 Troubleshooting

Operator may click on the 'Troubleshoot' button to view any Troubleshooting Document available.

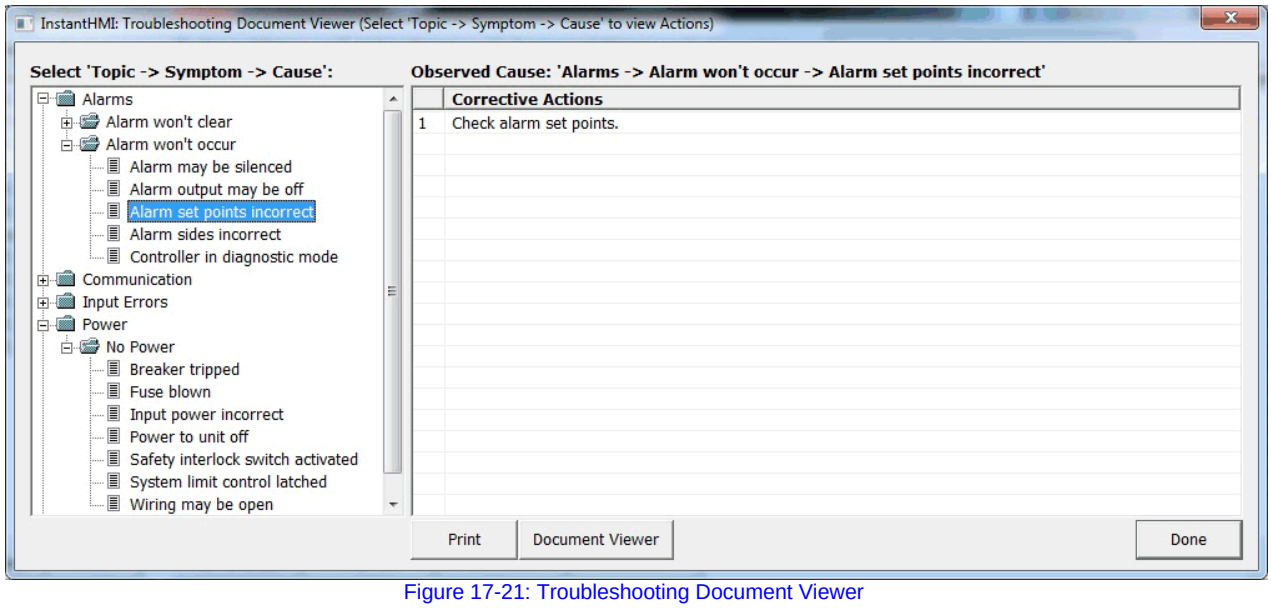


Figure 17-21: Troubleshooting Document Viewer

InstantHMI provides a special 'Troubleshoot Editor' tool (Section 2.3.2) to create an interactive troubleshooting document to help the operator at Runtime. With such a document displayed in the Troubleshooting Document Viewer, the Operator may select the Topic (based on the sub-system or machine or plant area of concern), identify the observed Symptom from the list of Symptoms in the document, and then select the probable Cause based on his experience. The displayed Corrective Action(s) may then guide the Operator on what action to take.

17.6 Alarm Documentation and Rationalization

Alarm Documentation and Rationalization is a broad topic. We highly recommend the excellent book published by ISA in 2011: "Alarm Management", by authors Bill Hollifield and Eddie Habibi. Many topics are covered in this book. Example:

Alarm Metrics:
How many alarms does the System generate per hour, and how does it compare to the (once / ten min) standard? What % are nuisance alarms?

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A. Installation, Registration and Activation

A.1 Overview

InstantHMI installation will include the LaunchPad Designer for your PC (Windows 7, Vista, XP) and Runtime Engines for one or more target platforms. You may order Runtime Engine for your PC ((Windows 7, Vista, XP), Windows Compact 7, Windows CE.Net (5.0 or later), and/or PDA (Pocket PC 2000 or later, Windows Mobile).

Note: The standard InstantHMI for Windows PC supports Unicode. Non-Unicode version to support older version of Windows (9x, 2000, ME, NT) is available to support customers with legacy platforms. Unless you have older Windows you should use the standard Unicode version of InstantHMI, which has the capability to support international languages.

A.1.1 Compatible Hardware

Certain features (such as color, serial connectivity, Bluetooth, WiFi) may not be supported by the hardware or may require a later version of Windows or Pocket PC. Other features may require hardware attachments or specific vendor manufactured PDA. For example, Trimble's Recons are rugged, and Symbol PDA support barcoding. InstantHMI correctly senses compatible hardware in most cases. The following table lists hardware that was known to be compatible. Please contact Software Horizons to determine if your hardware is compatible with InstantHMI.

Platform	Compatible Hardware	Remarks
Compact 7, CE.NET 5.0 or later	InstantPanel, AppSrvCE, ICP-DAS, Maple Systems, and compatibles with ARM, MIPS, X86, SH3, SH4 Processors.	InstantHMI Standard Features, Data Logging, Recipes, Barcode/RFID support, Scripting, Graphics and Color
Pocket PC 2000, 2002, 2003, Windows Mobile 5.x, 5.2 or later	Compaq/HP Ipaq 17xx, 19xx, 24xx, 36xx, 38xx, 39xx, 42xx, 59xx, 65xx, 69xx, 210 Dell Axim X3, X3i, X30, X5 Ecom Intermec 730, 740, CK32 Motorola Symbol PPT8800, MC35 PIDION Smartphone Trimble Recon, Nomad, Nomad X and compatibles from other manufacturers	InstantHMI Standard Features, Data Logging, Recipes, Barcode/RFID support, Scripting, Graphics and Color
Windows 7, Vista, XP	Trimble Yuma (Rugged Tablet), Bartec 19.1", 15", 12.1" (ATEX Certification, Class 1, Div II), and standard commercial PCs on the market,	Trimble and Bartec products are available as bundled systems from Software Horizons.

*Note: Development for Palm OS has been discontinued. Contact Software Horizons for availability of earlier versions of InstantHMI to support Palm OS 3.5 or later. Palm OS platforms do not support Uni-code.

Checking PDA Compatibility with InstantHMI

Step 1a:
To get started, download InstantHMI for Pocket PC/Windows Mobile/SmartPhone (IHMI-PPC-V52.exe) from http://www.instanthmi.com/download to your PC.

Step 1b:
Create a new folder on your PC Desktop and run IHMI-PPC-V52.exe. When prompted, extract all the files to the new folder. Make sure ActiveSync is installed on your PC and your Pocket PC is connected to your PC. Run setup.exe to begin installation. Click Install to begin the installation process. After agreeing to the License Agreement, you will see the 'InstantHMI Installation - Select Install Directory' dialog. Here you can specify where InstantHMI should be installed. If you are installing to an SD / CF card, click the browse button and choose the appropriate card (the path will typically be either **\Storage Card\InstantHMI** , **\SD Card\InstantHMI** or **\CF Card\InstantHMI**). The default **\InstantHMI** path will install InstantHMI to the Pocket PC's main storage memory.

Step 1c:
To obtain compatibility information from your Pocket PC:
1. Run InstantHMI on your PDA.

2. Note down PPC Serial Number (if any)
3. Exit InstantHMI
4. Connect Pocket PC to your computer
5. On PC start File Explorer
6. Navigate to the 'Mobile Device' folder in left pane
7. Under 'Mobile Device' select 'My Pocket PC'
8. Navigate to the 'InstantHMI' folder (See Step 1b.)
9. Copy the IHMI-Compatibility.dat file to your PC
10. Email IHMI-Compatibility.dat file back to Software Horizons (service@instanthmi.com)

A.1.2 InstantHMI License Agreement

We assume that you have read the InstantHMI Program license agreement and agree with its terms. If you have not read the license agreement we urge you to do so. Please recall that the license agreement clearly states **"You assume responsibility for the selection of the Program to achieve your intended results, and for the installation, use, and results obtained from the Program."**

Under no circumstances shall Software Horizons Inc. be held liable or responsible for indirect or consequential damages resulting from the use of or the application of InstantHMI individually or in combination with other software and or hardware. All persons using InstantHMI must be willing to accept responsibility to set up the various components in InstantHMI to suit their application and for choosing an application appropriate for the InstantHMI components, individually or in combination with other equipment. All figures and examples in this manual are for illustrative purposes only. In no way does including these figures and examples in this manual constitute a guarantee as to their suitability for any specific application. To test and approve all programs, prior to installation, is the responsibility of the end user.

A.1.3 InstantHMI Software License Activation

What is License Activation?
Software License Activation is a copy-protection scheme that uses an Activation Code to enable full functionality of our software product. It prevents the use of unlicensed software components and thus protects the software manufacturer as well as the customer interested in preventing the use of unlicensed software.

How does it work?
InstantHMI installation includes an Activation Utility. This utility allows you to run InstantHMI in an un-registered (and un-activated) Demo mode. If you choose to Register the software installation, the Activation Utility allows you to run the software as a 30-Day Evaluation. Customers who have paid for a product license will receive a Product Key which enables the activation upgrade to a (paid) product license to enable the desired functionality of the software.

IMPORTANT
When you purchase our software license you are in effect paying for the Product License Activation code. If you have problems after you have activated your registered software please contact us for assistance before Un-Installing / Re-Installing the software. Un-Installing / Re-Installing the software once it is activated will invalidate the previously activated software. Please see our Activation / Registration Policy below.

License Activation Policy:
Software Horizons will provide the customer with only one (1) Activation code for each purchased software product license that requires Activation. Once an activation code has been issued for a specific software installation, requests for additional activation codes (in conjunction with the same software license) will be subject to the following terms (as noted under the specific platforms).

PC Platform (LaunchPad Designer and Runtime Engine)

1. If you are unable to use the original registered and activated InstantHMI installation due to PC hardware failure you may request a new activation. (See Section A.6 for activation using USB Key).

   A. Email or fax to us a signed statement on your company letterhead describing the problem with your previous installation and the fact that you can no longer use the previous installation and that the re-installed software requires another activation code.
   B. There will be a nominal processing/re-activation fee of $50 + 10% of original software purchase price for your new activation. For example, if you ordered a $900 software package, your re-activation fee would be $50 + $90 or $140.
   C. On receipt of the statement in item 1.A and the payment in item 1.B above, Software Horizons will issue a re-activation code.

2. We will not honor any request for any further re-activations. You will need to purchase a new software license at full price.

CE, PDA and Smartphone Platforms (Runtime Engines)

1. Please backup your InstantHMI installation after it is registered and activated. Contact Software Horizons if you need help to do a proper backup. In case of a hard reset of your PDA, the backed up software can be restored to the original CE/PDA/Smartphone device. This should not require a new activation from Software Horizons.

2. Moving or Removing License from a CE, PDA and Smartphone is possible only if the License is installed on a removable memory card.

3. If you are unable to use the original registered and activated InstantHMI installation due to hardware failure you may request a new activation.

   A. Email or fax to us a signed statement on your company letterhead describing the problem with your previous installation and the fact that you can no longer use the previous installation and that the re-installed software requires another activation/registration code.
   B. There will be a nominal processing/re-activation fee of $50 + 10% of original software purchase price for your new activation. For example, if you ordered a $675 software package, your re-activation fee would be $50 + $67.50 or $117.50.
   C. On receipt of the statement in item 2.A and the payment in item 2.B above, Software Horizons will issue a re-activation code.

4. We will not honor any request for any further re-activations. You will need to purchase a new software license at full price.

This policy applies to any software from Software Horizons that requires a software License Activation code. If you have questions about Activation or about this policy, please contact:

Software Horizons Inc.,
100 Treble Cove Road, N. Billerica, MA 01862, USA
Tel: 978-670-8700 Fax: 978-670-8787
Website: www.InstantHMI.com

A.2 Installing InstantHMI

InstantHMI provides Platform Scalable, Platform Independent HMI technology for PC, Window CE and PDA (Pocket PC, Windows Mobile) platforms. InstantHMI LaunchPad Development System is used to design your HMI project (screens, tag database, macros, scripts etc.) and then to deploy the project to the target platform (PC, CE or PDA). You need to Install the LaunchPad on a Windows PC and the Runtime Engine(s) on the appropriate target platform (PC, CE or PDA).

InstantHMI Installation Path and Files

Program Files		
Platform		**Path**
7, Vista, XP	32 Bit	C:\Program Files\InstantHMI 6.1
	64 Bit	C:\Program Files (x86)\InstantHMI 6.1

Exe, Dll and Help Files:

1. Path*.exe
2. Path*.dll
3. Path\Help
4. **Other Files:**
5. ath\ReadME.tx
6. Path\license.txt
7. Path\version.txt
8. Path\IHMI-MacroCommands.txt
9. **Path\ IHMI-ScriptFunctions.txt**
10. Path\website.ico
11. Path\gtmh & ihmi internet shortcuts
12. Path\IHMIPcDs.dll.cm.ini
13. Path\IHMIPcRt.dll.cm.ini
14. Path\PPCSkin.bmp
15. Path\AboutScrollText.txt

Project Files		
Platform		**Path**
XP	**All Users**	**C:\Documents and Settings\All Users\Shared Documents\InstantHMI 6.1**
	Per User	**C:\Documents and Settings\<*UserName*>\Documents\InstantHMI 6.1**
7, Vista	**All Users**	**C:\Users\Public\Public Documents\InstantHMI 6.1**
	Per User	**C:\Users\<*UserName*>\[My]Documents\InstantHMI 6.1**

Standard (System) Projects and Customer Projects:

1. Path\Projects\Demo
2. Path\ Projects\MyProject
3. Path\ Projects\Quick Start – PC
4. Path\ Projects\Sample Project
5. Path\ Projects\<Customer Projects>
6. Path\Settings\Template
7. Path\Settings\IHMI-6.ini

Note: Software Horizons' Tech Support will take care of any assistance with other Folders, Registry Entries etc. as needed.

A.2.1 Installing InstantHMI from Download

You may Download LaunchPad & PC Runtime, Pocket PC Runtime, etc. from www.InstantHMI.com or you may use the installation CD from Software Horizons. InstantHMI installation for your PC (Download or CD) includes both the LaunchPad and the Runtime Engine.

InstantHMI
Platform Scalable, Platform Independent
'Cloud Ready' HMI/SCADA Technology
InstantHMI Software Downloads
for Windows PC, Windows CE, PDA and Smartphones
LaunchPad Designer and 'Cloud Ready' PC Runtime Engine
Ver. : 6.1.8 Build 4001
Date : October 5, 2011 (Code 1K14)
Size : 83.0 MB
Download
Documentation and additional info:
- Installation + Evaluation License
- Quick Start Guide
- InstantHMI Brochure
- Rugged Tablet (YUMA) Specs.
LaunchPad Development System, PC Runtime Engine, Quick Start Guide, Manual and Free Demo.
Caution: Customers with InstantHMI v6.0 or earlier license, must order a license upgrade before installing v6.1.
'GoToMyHMI' at your Service
InstantHMI 6.1 is ready to serve you on the cloud today. GoToMyHMI provides Secure, Simple and Speedy access to InstantHMI 6.1 from any Browser on your device; and the Services to remotely Monitor, ACK Alarm and Control (Data Entry), for one low flat fee.
'GoToMyHMI' Services
'GoToMyHMI' Service Manual
Pocket PC / Windows Mobile / Smartphone Runtime Engine
Ver. : 6.0.10 Build 4008
Date : June 29, 2011
Size : 2.65 MB
Download
Documentation and additional info:
- Quick Start Guide
- InstantHMI Brochure
- Application Notes
- Rugged PDA (NOMAD) Specs.
Runtime Engine for Pocket PC, Windows Mobile, Smartphone and Memory Cards (SD, CF, etc.).
Windows CE (ARM CE 5.0/6.0) Runtime Engine
Ver. : 6.0.10 Build 4008
Date : June 29, 2011
Size : 2.64 MB
Download
Request Download for your CPU and OS
Documentation and additional info:
- Quick Start Guide
- InstantHMI Brochure
- InstantPanel Specs
Runtime Engine for CE Touch Panels and Memory Cards (SD, CF, etc.).

Figure A-1: InstantHMI Download Page

Installing LaunchPad Designer on PC

We illustrate using download of the PC-Installation file IHMI52-PCInstall-Unicode.exe. Click on the PC link 'Download v5.2'. Note: select the latest version appropriate for you. If you see a 'File Download-Security Warning' confirm that you are downloading InstantHMI software and then click on Save to save the file to your computer. Create a new folder ('IHMI-5 Download', for example) on your desktop to receive the downloaded file. The download takes a minute or two in most cases and its progress is indicated.

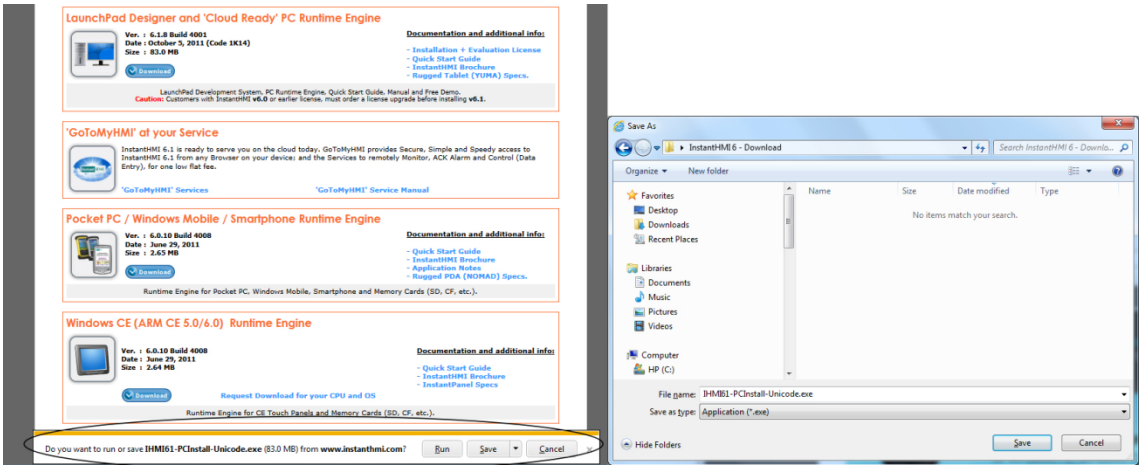


Figure A-2: Downloading and Saving to a Folder

When finished downloading, click on Open. If you see a 'Open File -Security Warning' confirm that you have downloaded InstantHMI software (IHMI52-PCInstall-Unicode.exe) and then click on RUN. This runs the self-extracting executable file IHMI52-PCInstall-Unicode.exe.

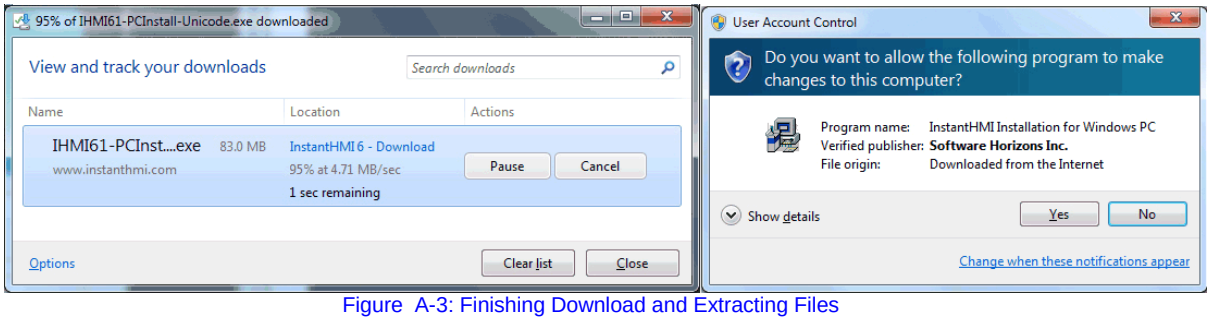


Figure A-3: Finishing Download and Extracting Files

You will see a Welcome screen 'InstantHMI Installation for Windows PC'. Click on Install button to start the installation. (Note that InstantHMI supports Runtime Engines on multiple target platforms. Your download includes the InstantHMI LaunchPad Designer as well as the PC Runtime Engine, as indicated by the hilighted target platform image.)

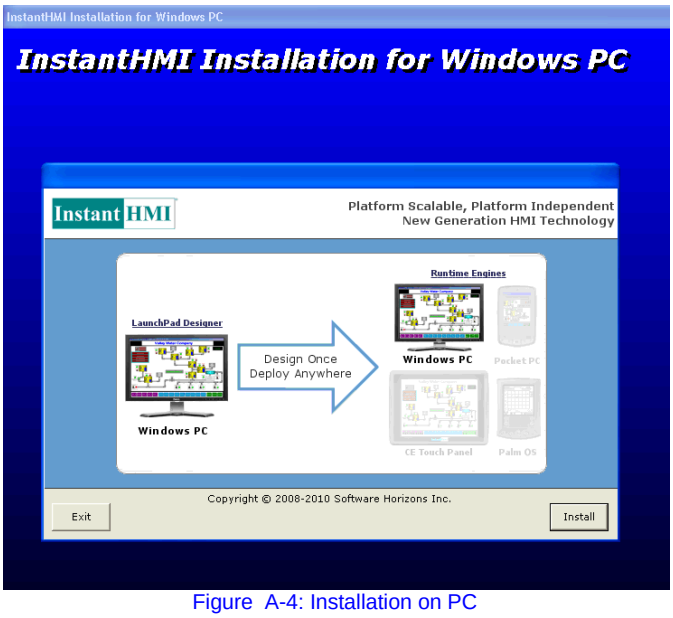


Figure A-4: Installation on PC

If a previous version of InstantHMI was installed on your PC, you should see a dialog like the one shown. Choose whether or not to overwrite existing projects on your PC. In general, Demo and Quick Start-PC are standard projects provided by Software Horizons (and will be updated). 'My Project' is a project stub provided for your use and if you have created screens etc. in this project folder you may not want to overwrite 'My Project'. It is always a good idea, to use your own project names and/or backup your projects so that there is no possibility of accidental overwrites or loss of your data. Click the Next button to continue with the installation.

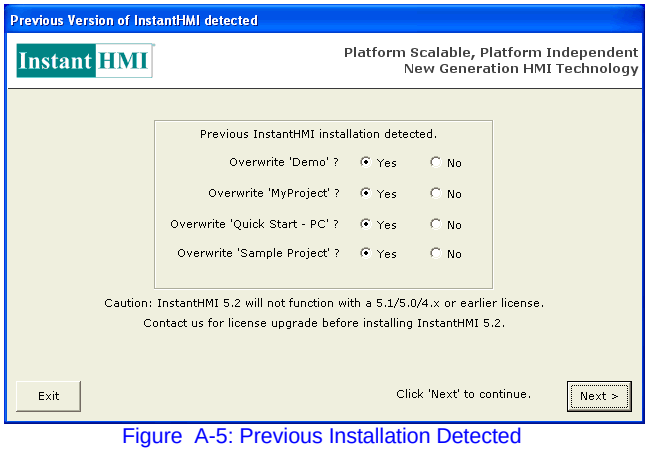

Previous Version of InstantHMI detected
Instant HMI
Platform Scalable, Platform Independent
New Generation HMI Technology
Previous InstantHMI installation detected.
Overwrite 'Demo' ? Yes No
Overwrite 'MyProject' ? Yes No
Overwrite 'Quick Start - PC' ? Yes No
Overwrite 'Sample Project' ? Yes No
Caution: InstantHMI 5.2 will not function with a 5.1/5.0/4.x or earlier license.
Contact us for license upgrade before installing InstantHMI 5.2.
Exit
Click 'Next' to continue.
Next >

Figure A-5: Previous Installation Detected

You will be informed of the progress while the installation files are being extracted from the downloaded file IHMI52-PCInstall-Unicode.exe. When this extraction is complete, you are ready to begin the installation process. Exit all other Windows programs. To quit without installing InstantHMI click on Exit.

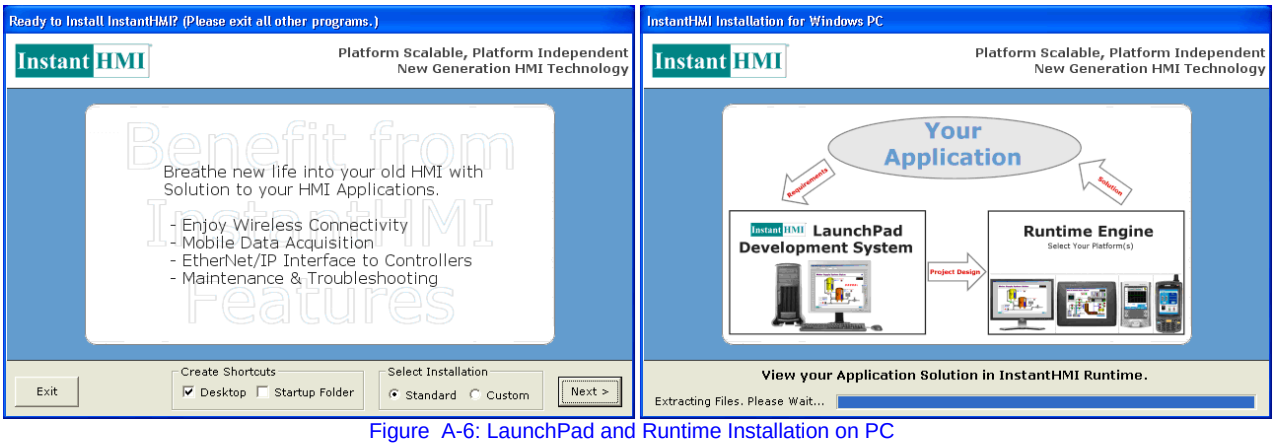


Figure A-6: LaunchPad and Runtime Installation on PC

Standard Installation : 'Standard' Installation is the default selection and uses the default installation folder (C:\IHMI-5) for the InstantHMI programs (LaunchPad Designer, PC Runtime Engine, etc.). If this is acceptable click on Next to continue with the installation. You will see the InstantHMI License Agreement. You may select 'I Disagree' and click Exit to quit installing InstantHMI. If you select 'I Agree' you will be able to click on Next to continue with the installation.

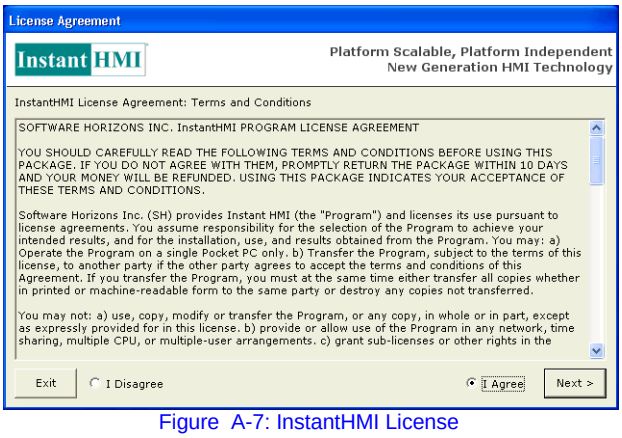

License Agreement
Platform Scalable, Platform Independent
New Generation HMI Technology
InstantHMI License Agreement: Terms and Conditions
SOFTWARE HORIZONS INC. InstantHMI PROGRAM LICENSE AGREEMENT
YOU SHOULD CAREFULLY READ THE FOLLOWING TERMS AND CONDITIONS BEFORE USING THIS PACKAGE. IF YOU DO NOT AGREE WITH THEM, PROMPTLY RETURN THE PACKAGE WITHIN 10 DAYS AND YOUR MONEY WILL BE REFUNDED. USING THIS PACKAGE INDICATES YOUR ACCEPTANCE OF THESE TERMS AND CONDITIONS.
Software Horizons Inc. (SH) provides Instant HMI (the "Program") and licenses its use pursuant to license agreements. You assume responsibility for the selection of the Program to achieve your intended results, and for the installation, use, and results obtained from the Program. You may: a) Operate the Program on a single Pocket PC only. b) Transfer the Program, subject to the terms of this license, to another party if the other party agrees to accept the terms and conditions of this Agreement. If you transfer the Program, you must at the same time either transfer all copies whether in printed or machine-readable form to the same party or destroy any copies not transferred.
You may not: a) use, copy, modify or transfer the Program, or any copy, in whole or in part, except as expressly provided for in this license. b) provide or allow use of the Program in any network, time sharing, multiple CPU, or multiple-user arrangements. c) grant sub-licenses or other rights in the
Exit
I Disagree
I Agree
Next >

Figure A-7: InstantHMI License

Custom Installation: Select 'Custom' installation to select the installation folder (C:\IHMI-5 is the default) for the InstantHMI programs (LaunchPad Designer, PC Runtime Engine, etc.). Next comes the selection of the Program folder (InstantHMI 5.2 Human Machine Interface, by default), where the Program icons (shortcuts) will be installed.

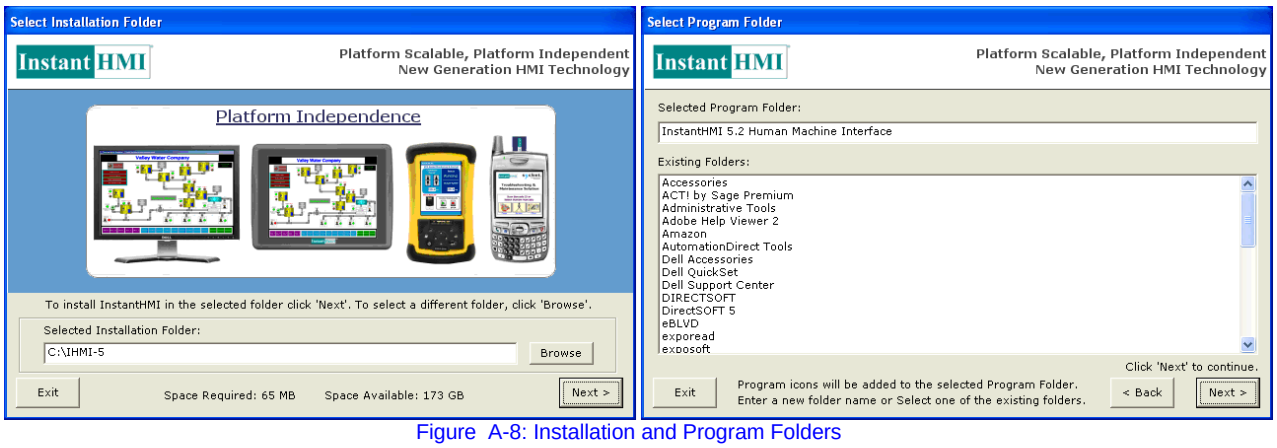


Figure A-8: Installation and Program Folders

You will now see the Current Settings selected by you for your installation. Click 'Back' to change any settings. Click Next to start the process of copying program files to complete the installation.

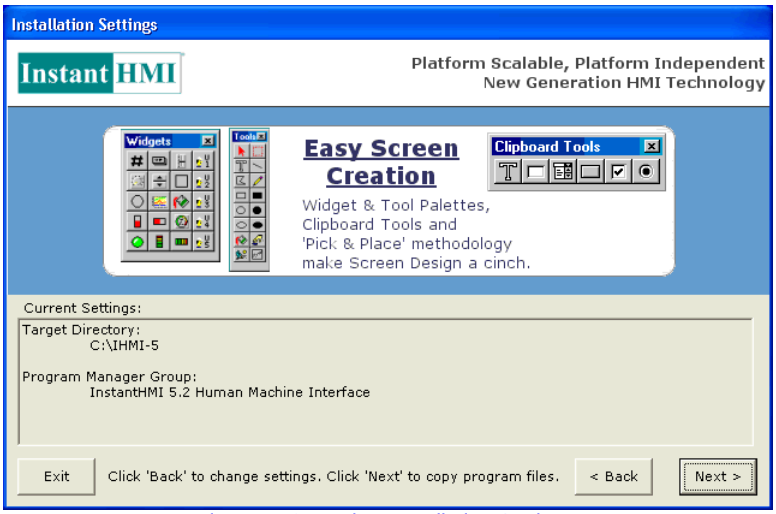


Figure A-9: Review Installation Settings

While extracting and copying files you will see several informative bitmaps illustrating important and useful features of InstantHMI you can benefit from. When Installation is complete you will be so informed in a Thank You dialog.

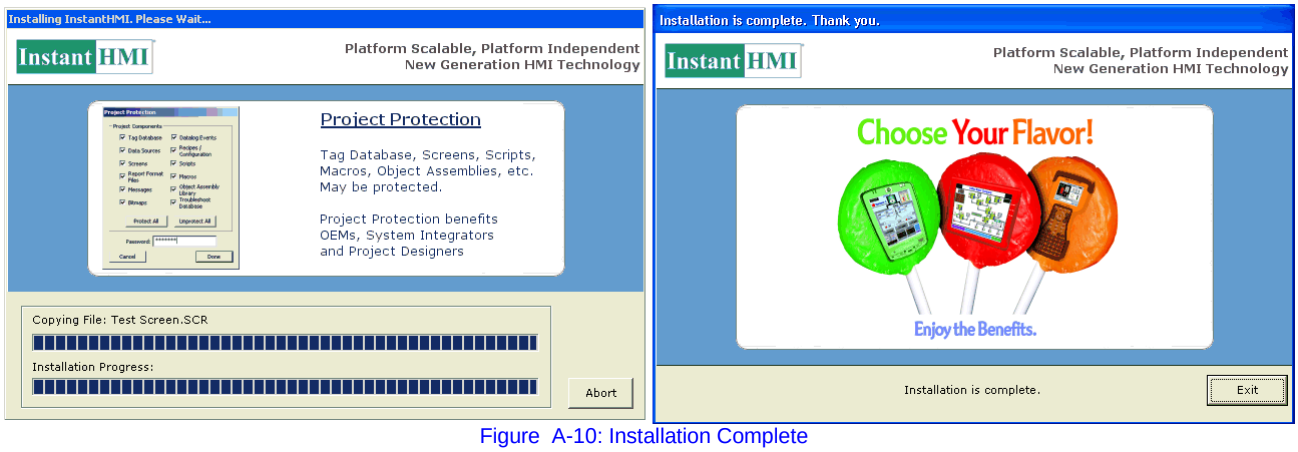


Figure A-10: Installation Complete

Click on Exit to finish the installation of InstantHMI (LaunchPad and Runtime) on your PC. This will lead to the InstantHMI Activation utility to run automatically (Section A.3).

InstantHMI Runtime Engine for PC

When you install the LaunchPad Designer on your PC, the Runtime Engine for PC is automatically installed (See above).

InstantHMI Runtime Engine for CE

If you have ordered InstantPanel CE touch systems from Software Horizons, the runtime engine is pre-installed and ready to go. You may find downloadable software for popular CE platforms (IHMI-WCE-ARM-v52.exe for CE 5.0/5.2 running on ARM processors). If you do not find the InstantHMI Runtime software for your CE platform, contact Software Horizons.

In order to Install InstantHMI for CE, you must have Microsoft ActiveSync (or other equivalent Synchronization software downloadable from Microsoft Windows Mobile Device Center) installed on your PC. Establish an ActiveSync connection from your PC to your CE device before starting installation. The CE device must remain connected throughout the installation process. Removing

the CE device during installation can cause unpredictable results and possible loss of data. Once your CE device is connected, click on Install button to begin installation.

Figure A-11: Windows CE Runtime Installation

InstantHMI Runtime Engine for PDA

InstantHMI LaunchPad Designer software must be installed before installing runtime engine (IHMI-PPC-v52.exe from the InstantHMI download page) for PDA (Pocket PC, Windows Mobile or Smartphone).

In order to Install InstantHMI for PDA, you must have Microsoft ActiveSync (or other equivalent Synchronization software downloadable from Microsoft Windows Mobile Device Center) installed on your PC. Establish an ActiveSync connection from your PC to your PDA device before starting installation. The PDA must remain connected throughout the installation process. Removing the PDA during installation can cause unpredictable results and possible loss of data. Once your PDA is connected, click on Install button to begin installation.

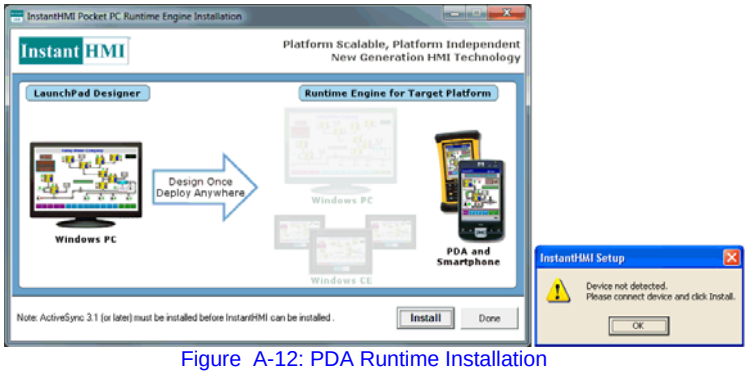


Figure A-12: PDA Runtime Installation

A.2.2 Installing InstantHMI from CD

Insert the InstantHMI CD into your CD/DVD-ROM drive, the installation will start automatically. If not, click Start → Run then type X:\setup.exe (where X is your CD/DVD-ROM drive) to begin installation. You will see the following dialog. Click on the appropriate button for your platform (PC, CE or PDA).

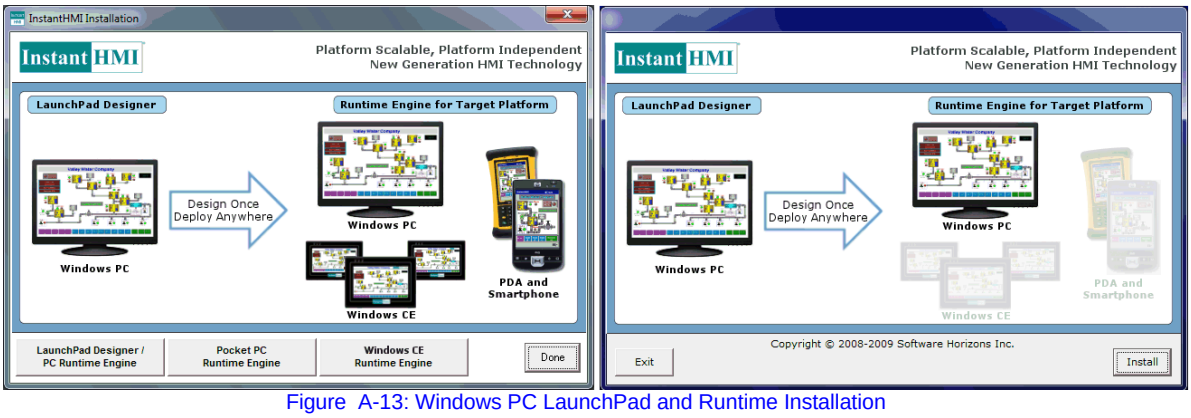


Figure A-13: Windows PC LaunchPad and Runtime Installation

InstantHMI LaunchPad and Runtime Engine for PC

Click on 'LaunchPad Designer / PC Runtime Engine' to start the installation. The rest of the installation is exactly as described above (Section A.2.1 under the heading 'Installing InstantHMI from Download').

> Security Requirements to run InstantHMI on Windows 7, Vista and XP
> InstantHMI should be installed under the Administrator account or an account with full administrative privileges.
>
> 1. The InstantHMI install directory, including all files and folders need Full-Control Access
> 2. Depending on the OS, individual user-temp folders (\Documents and Settings\Username\Local Settings\temp) need Full-Control Access
> 3. The C:\Windows\Temp need Full-Control Access

InstantHMI Runtime Engine for PDA

Click on 'PDA/PocketPC Runtime Engine' to start the installation. The rest of the installation is similar to that described above (Section A.2.1 under the heading 'Installing InstantHMI from Download').

InstantHMI Runtime Engine for CE

Click on 'Windows CE Runtime Engine' to start the installation. The rest of the installation is similar to that described above (Section A.2.1 under the heading 'Installing InstantHMI from Download').

For License Activation information see Section A.3.

A.2.3 Converting Old InstantHMI Projects (Version 4.x to 5.2)

Note: 5.0, 5.1 projects will become automatically compatible with 5.2; all you do is open each screen and resave them.
We have provided a Batch file listed below to help you with the conversion.

```
@echo off
echo    IHMI4-IHMI5.bat : Converts InstantHMI 4.x Projects to 5.2
echo    ---------------------------------------------------------------------------
echo Step 1: It will backup your InstantHMI 4.x Project Files
echo Step 2: It will rename 4.x databases to match 5.2 conventions.
echo .
echo To use:
echo -------
echo 1. Install InstantHMI 5.2 ( C:\IHMI-5 or C:\IHMI-4, if previous 4.x installation exists).
echo This will retain all project folders you have created.
echo .
echo 2. Copy IHMI4-IHMI5.bat file to 4.x PROJECT Folder (to be converted to 5.0)
echo  (EXAMPLE:  C:\IHMI-5\Test Project)
echo .
echo 3. Run IHMI4-IHMI5.bat
echo ============================================================
echo .
echo Type 'Ctrl C' to Terminate this Batch Job.
pause
md IHMI4-Project-Backup
copy *.* IHMI4-Project-Backup /v

md IHMI4-DB-Backup

copy IHBMP.idb IHMI4-DB-Backup
copy IHCONFIG.idb IHMI4-DB-Backup
copy IHDLEVENTS.idb IHMI4-DB-Backup
copy IHDSM.idb IHMI4-DB-Backup
copy Macros.idb IHMI4-DB-Backup
copy IHMSG.idb IHMI4-DB-Backup
copy Network.idb IHMI4-DB-Backup
copy MasterSetup.idb IHMI4-DB-Backup
copy IHRCP.idb IHMI4-DB-Backup
copy IHRecPrefDB.idb IHMI4-DB-Backup
copy IHScanHist.idb IHMI4-DB-Backup
copy IHMISettings.idb IHMI4-DB-Backup
copy IHSystemDB.idb IHMI4-DB-Backup
```

```
copy IHTDB.idb IHMI4-DB-Backup
copy IHTShoot.idb IHMI4-DB-Backup
copy IHMIUsers.idb IHM4-DB-Backup

ren  IHBMP.idb IHMI-ImageDB.idb
ren  IHCONFIG.idb IHMI-ConfigDB.idb
ren  IHDLEVENTS.idb IHMI-DatalogEventsDB.idb
ren  IHDSM.idb IHMI-DataSourceDB.idb
ren  Macros.idb IHMI-MacrosDB.idb
ren  IHMSG.idb IHMI-MessageDB.idb
ren  Network.idb IHMI-NetworkDB.idb
ren  MasterSetup.idb IHMI-ProtectionDB.idb
ren  IHRCP.idb IHMI-RecipeDB.idb
ren  IHRecPrefDB.idb IHMI-PreferenceDB.idb
ren  IHScanHist.idb IHMI-ScanHistoryDB.idb
ren  IHMISettings.idb IHMI-SettingsDB.idb
ren  IHSystemDB.idb IHMI-SystemDB.idb
ren  IHTDB.idb IHMI-TagDB.idb
ren  IHTShoot.idb IHMI-TroubleshootDB.idb
ren  IHMIUsers.idb IHMI-UsersDB.idb

echo IHMI4-IHMI5.bat file finished.
```

A.2.4 Converting Old InstantHMI Projects (Version 5.2 or 6.0 to 6.1)

Note: 5.2 and 6.0 projects will become automatically compatible with 6.1; all you do is open each screen and resave them. A simple trick to do the conversion is to use the Protect feature in LaunchPad ➔ Setup (Section 2.4.3). If you select all the project elements and go through the motion of protecting (use a simple password such as 'a'). This will resave all the screens and other project elements and do any necessary conversion. Then un-protect the project selecting all elements. That's it.

A.2.5 Converting InstantHMI 6.0 Project (Software Activation) to InstantHMI 6.1 USB Key Activation

1. Existing (OLD 6.0) Project and Installation
   A. Confirm that you have an existing C:\IHMI-6 installation folder with InstantHMI 6.0 Project sub-folder 'YourProject' with satisfactory functionality.
   B. Close all InstantHMI Programs (LaunchPad and Runtime).

1. In Windows Explorer, Copy C:\IHMI-6 folder to C:\IHMI-60. This will serve as your backup of existing project and installation.

2. Install InstantHMI 6.1 using default setup options into C:\IHMI-6 folder as usual. (If necessary, do this with Administrative Privileges.)

3. Copy your project folder 'C:\IHMI-60\YourProject' to C:\IHMI-6.

4. Run Your Project under 6.1 (New version)
   A. Exit from all InstantHMI programs (Runtime and LaunchPad).
   B. Plug the USB Key (with License for InstantHMI 6.1) to your PC.
   C. Check everything as necessary to ensure Your Project functionality.
   D. If satisfied with Step C, exit from Runtime back to LaunchPad. In LaunchPad, convert Your Project files from 6.0 to 6.1: Use Setup ➔ Protect (all project elements) trick which converts all screens automatically. Repeat and Unprotect (all project elements) which gets project screens etc. ready to modify as necessary.
   E. If satisfied with Step C skip to Step 8; if not satisfied with Step C you will return to 6.0 version in Step 7.

5. In Windows Explorer, Copy C:\IHMI-6 folder to C:\IHMI-61. This will serve as your backup of new 6.1 project and installation.

6. Run Your Project under 6.0 (Old version)
   A. Exit from all InstantHMI programs (Runtime and LaunchPad).
   B. Unplug the USB Key (meant for 6.1)
   C. Copy all files and sub-folders from 'C:\IHMI-60' backup folder **carefully** to 'C:\IHMI-6' folder. (You may need to select the contents of the folder 'C:\IHMI-60' using ctrl-A, right-click to Copy, navigate to target folder 'C:\IHMI-6', right click and Paste, etc.)
   D. Now IHMI-6 folder contains the Old (6.0) installation and project. Run the project and confirm that it works as it did before starting the switch over to New (6.1) installation and project.
   E. Do not continue to Step 8 until you are satisfied with Step 5.C.

7. De-Activate Old 6.0 License (and use 6.1 USB Key only in future)
   Note: Do **Not** perform this Step if you are not satisfied with Step 5.C. You will continue to run under old version 6.0 as in Step 7.
   A. Exit from all InstantHMI programs (Runtime and LaunchPad).
   B. Unplug the USB Key (meant for 6.1)
   C. From Windows Start menu, Run the InstantHMI 6.1 Activation Utility as an Administrator. Select LaunchPad and click on De-Activate button. You should see the following dialog.

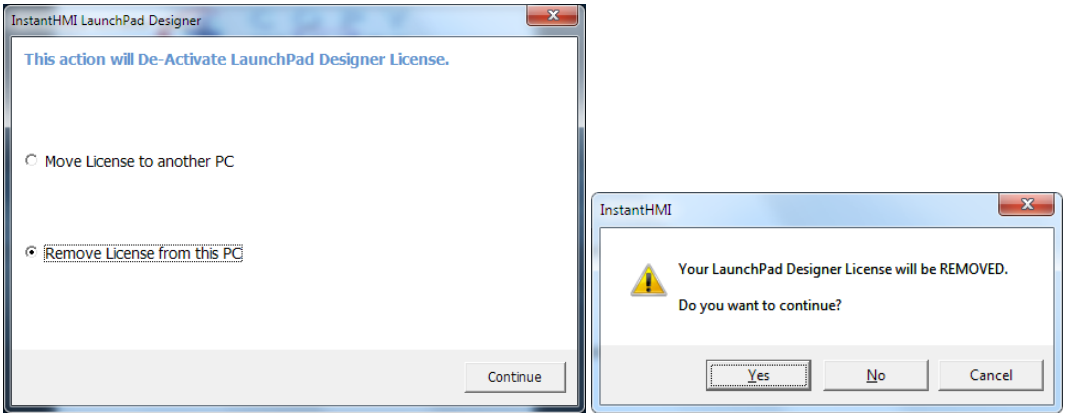


Figure A-14: De-Activate-LP

Select 'Remove License from this PC' and click Continue. You will see a Warning dialog and if you are sure you want the 'License to be REMOVED' then click Yes. De-activation will proceed and you will return to the Activation Utility dialog, where you will see License Status 'Not Activated'.

After de-activating LaunchPad, repeat this process for Runtime Engine.

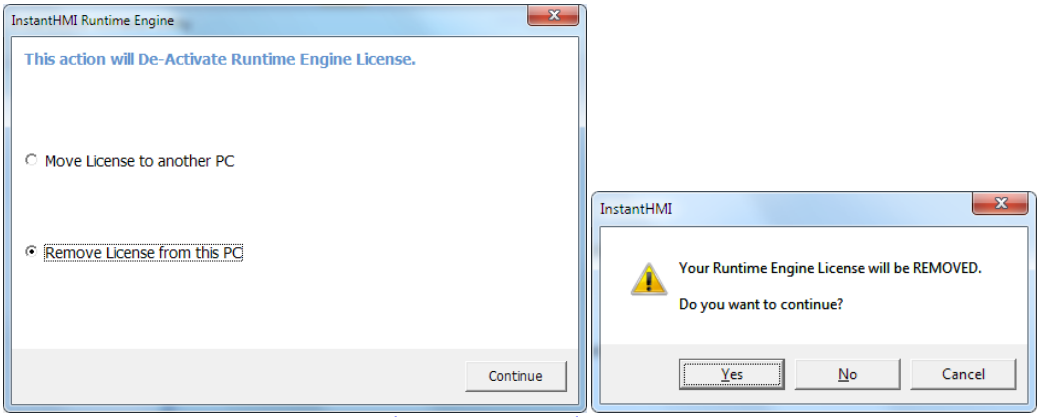


Figure A-15: De-Activate-RT

   D. De-activation files 'De-ActivateConfirmation-IHMI-6WLP-XXXX-XXXX-XX', and 'De-ActivateConfirmation-IHMI-6WRT-XXXX-XXXX-XX' generated on your computer must be

emailed to Software Horizons to complete the de-activation process (and to avoid additional license charges).

A.3 InstantHMI Activation Utility

A.3.1 Introduction

The InstantHMI Activation Utility allows you to activate your InstantHMI LaunchPad and PC Runtime Engine installations. Without activation InstantHMI will run only in a limited Demo Mode. To enjoy all of the features you need to activate. Activating for Evaluation is Automatic if you have an Internet connection; all you do is fill in a registration form and let the Activation Utility take care of the rest.

You may also email the registration information to Software Horizons (activate@InstantHMI.com). Once Software Horizons receives your registration information you will be issued an activation code that will be entered through the Activation Utility to enable your InstantHMI installation.

The activation utility also allows you to move (transfer) the Product License activation from one computer to another as long as you agree to Internet activation and verification. This process is explained in Section A.4. **Note:** The facility to move or remove activation is **only** available for InstantHMI PC installations. InstantHMI activation on the PDA and CE cannot be moved; such installation may be backed up after activation and restored on the same PDA or CE device (see Section A.4.3, A.4.4).

A.3.2 Activation of PC LaunchPad Designer License

You may run the InstantHMI Activation utility at any time by clicking on Help ➔ Register/Activate button in the LaunchPad Designer and then review/change the activation status. When installation is complete, the InstantHMI Activation utility is run automatically.

Note: After installing the LaunchPad Designer and the Runtime Engine on your PC, you will need a Product Key to have your Product License (LaunchPad as well as Runtime) activated so that you may enjoy the full benefits of the InstantHMI software. You may purchase the Product License(s) and receive the Product Key(s) from Software Horizons; or you may Register the product(s) as a free 30-day Evaluation License.

We illustrate the Activation process in detail for LaunchPad Designer. The Runtime Engine Activation will be similar. When the InstantHMI Activation Utility runs you will see the following dialog.

Figure A-16: LaunchPad Designer Activation

LaunchPad Designer is selected by default and the Activation Status is shown (Not Activated). Click Activate Now. You will see the Activation Mode dialog.

A.3.2.1 Activation Modes

The Activation Mode dialog allows you to select one of the three modes in which you can use InstantHMI: License Mode, Evaluation Mode and Demo Mode.

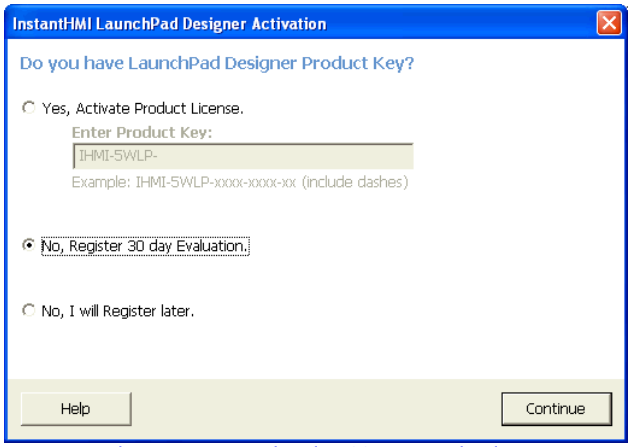


Figure A-17: Registering 30-Day Evaluation

1. License Mode (You have Product Key)

If you have purchased a product license (LaunchPad Designer) and have the Product Key (provided by Software Horizons) choose 'Yes, Activate Product License' and click 'Continue'. Use the Automatic or Manual Activation process described below (Section A.3.2.2), your installation Activation Status will be 'License Activated'.

Note: If you have purchased a product license you may use Evaluation Mode while waiting to receive the Product Key.

2: Evaluation Mode (You do not have Product Key yet)

If you have not yet purchased a product license (LaunchPad Designer and/or Runtime Engine) and wish to use the product in an 'Evaluation' mode, choose 'No, Register 30 day Evaluation' and click 'Continue'. Use the Automatic or Manual Activation process described below (Section A.3.2.2), your installation Activation Status will be 'Evaluation Activated'.

3: Demo Mode (You do not wish to Register for Evaluation)

If you do not wish to Register for Evaluation but only use the product in a 'Demo' mode, choose 'No, I will Register later' and click 'Continue'. You will return to the previous dialog (Activation utility startup dialog). Your installation Activation Status will be 'Not Activated'. You may click X to exit the Activation Utility and proceed to use InstantHMI without registration in a Demo mode, where you can verify suitability for your application but without a communication driver.

A.3.2.2 Activation Process: Automatic or Manual

The Software License Activation Process may proceed in one of two ways: Automatic or Manual.

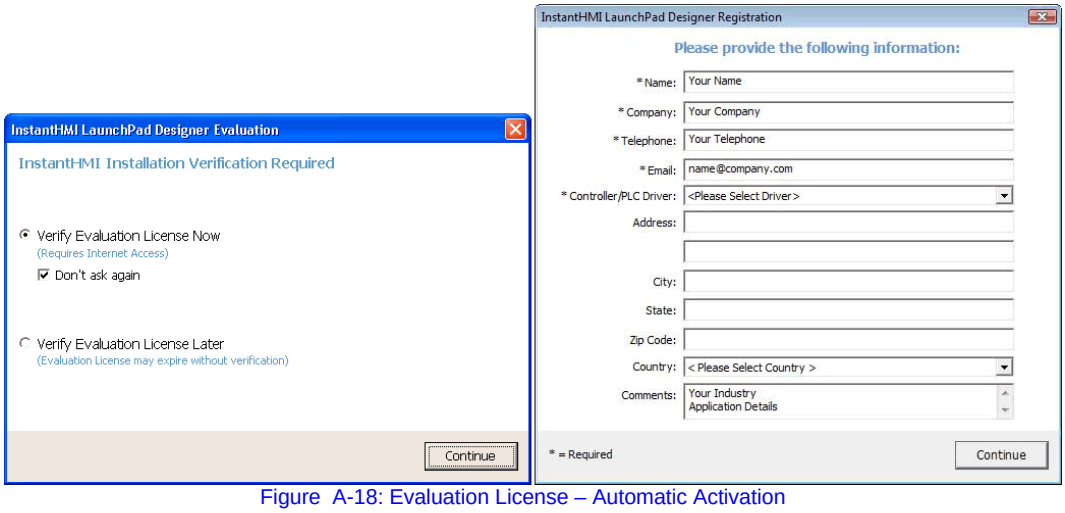


Figure A-18: Evaluation License – Automatic Activation

Automatic Activation

If you have an Internet connection, choose the recommended 'Automatic Activation' method, illustrated here for Evaluation License. Please fill-in the Registration Form. In order that we can provide a suitable Evaluation Activation, communication driver and any available relevant projects, please indicate your industry (such as Water/Waste Water, Motion control, Process Control, Oil and Gas, Packaging, etc.) and your application details (such as what controller you are planning to use and what HMI functionality you are looking for).

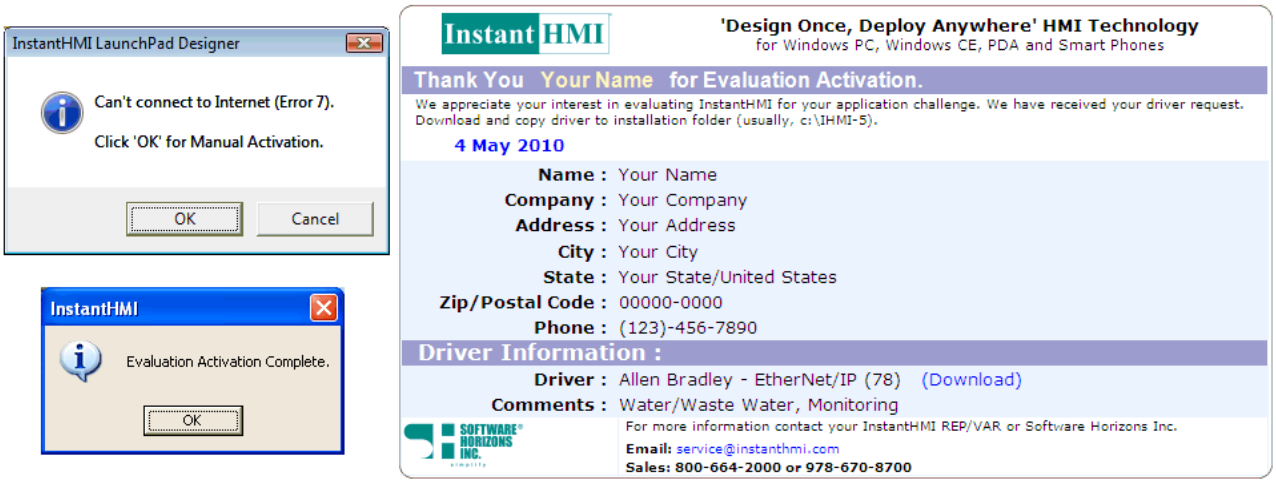

InstantHMI LaunchPad Designer
Can't connect to Internet (Error 7).
Click 'OK' for Manual Activation.
OK
Cancel
InstantHMI
Evaluation Activation Complete.
OK
InstantHMI
'Design Once, Deploy Anywhere' HMI Technology
for Windows PC, Windows CE, PDA and Smart Phones
Thank You Your Name for Evaluation Activation.
We appreciate your interest in evaluating InstantHMI for your application challenge. We have received your driver request.
Download and copy driver to installation folder (usually, c:\IHMI-5).
4 May 2010
Name : Your Name
Company : Your Company
Address : Your Address
City : Your City
State : Your State/United States
Zip/Postal Code : 00000-0000
Phone : (123)-456-7890
Driver Information :
Driver : Allen Bradley - EtherNet/IP (78) (Download)
Comments : Water/Waste Water, Monitoring
For more information contact your InstantHMI REP/VAR or Software Horizons Inc.
Email: service@instanthmi.com
Sales: 800-664-2000 or 978-670-8700

Figure A-19: Internet Activation Confirmation and Email with Link to Download Driver

If Internet connection is not established you will see an Error Message box as shown. Otherwise, your InstantHMI installation will be automatically activated over the Internet and where applicable you will receive a link via Email for your driver download as indicated in Figure A-19.

Manual Activation

(If you have an Internet connection, choose the recommended 'Automatic Activation' method for your greatest convenience.) If you select the 'Manual Activation' method, you will see the Manual Evaluation Activation dialog, and a two-step process.

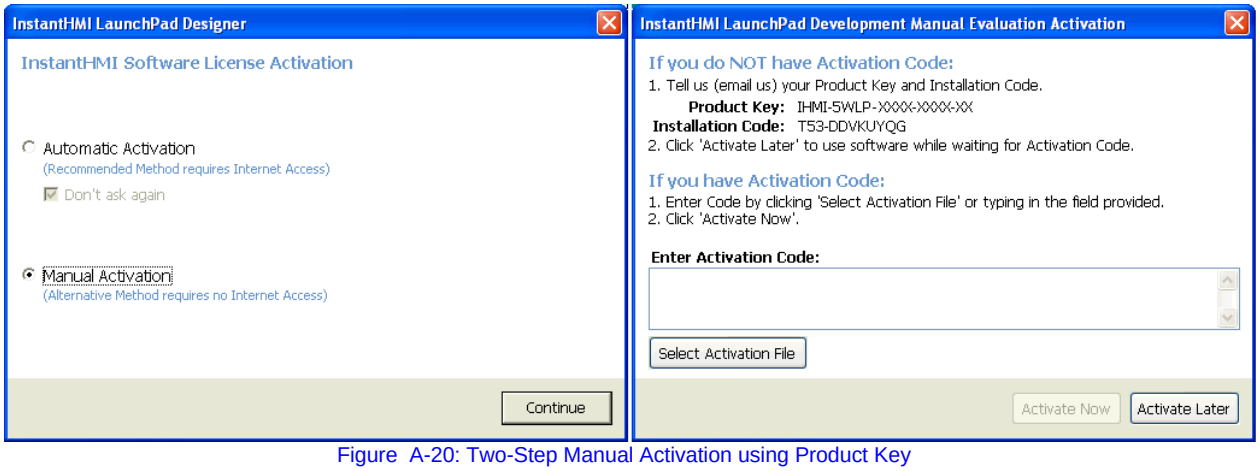

InstantHMI LaunchPad Designer
InstantHMI Software License Activation
Automatic Activation
(Recommended Method requires Internet Access)
Don't ask again
Manual Activation
(Alternative Method requires no Internet Access)
Continue
InstantHMI LaunchPad Development Manual Evaluation Activation
If you do NOT have Activation Code:
1. Tell us (email us) your Product Key and Installation Code.
Product Key: IHMI-5WLP-XXXX-XXXX-XX
Installation Code: T53-DDVKUYQG
2. Click 'Activate Later' to use software while waiting for Activation Code.
If you have Activation Code:
1. Enter Code by clicking 'Select Activation File' or typing in the field provided.
2. Click 'Activate Now'.
Enter Activation Code:
Select Activation File
Activate Now
Activate Later

Figure A-20: Two-Step Manual Activation using Product Key

Step 1: Email the 'Product Key' and 'Installation Code' to Software Horizons (activate@InstantHMI.com). While waiting for the activation code, click 'Activate Later' and proceed to use the software in the un-registered Demo mode.

Step 2: Later, when you have received the Activation Code, run the InstantHMI Activation utility by clicking on Help ➔ Register/Activate button, access the Manual Evaluation Activation dialog and enter the Activation Code and click 'Activate Now'. Your installation Activation Status will be set to 'Evaluation Activated'.

Evaluation Activation Expiry

Evaluation License is usually valid for a period of 30 days. As the evaluation period nears expiry, you will be so reminded when you run LaunchPad. After Evaluation expires, InstantHMI will run in the Demo mode.

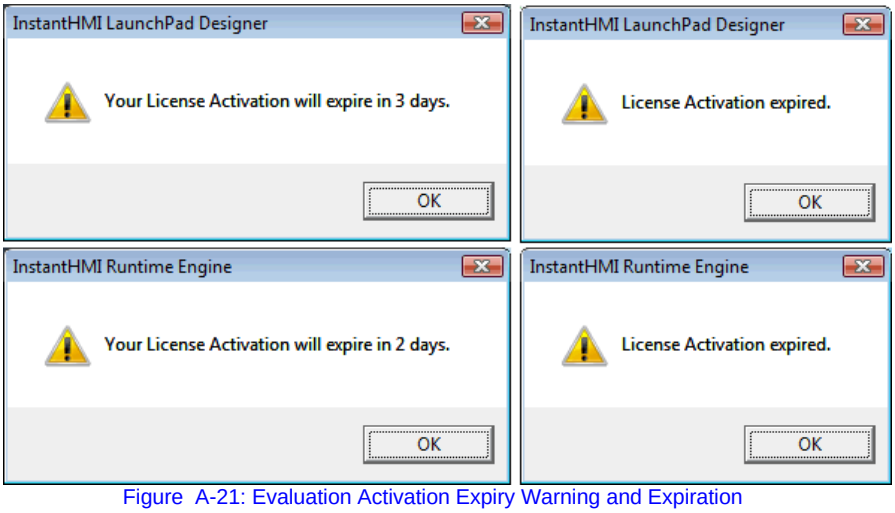


Figure A-21: Evaluation Activation Expiry Warning and Expiration

We hope that your evaluation will convince you to purchase the InstantHMI Product License. You may then use the InstantHMI Activation Utility to 'Upgrade Activation' to Product License and enjoy the full benefits of InstantHMI for your application (Section A.3.2.4).

A.3.2.3 Running LaunchPad after Activation

Exit the Activation Utility; this should invoke the LaunchPad automatically. If you have not run the LaunchPad before, you will see the following dialog.

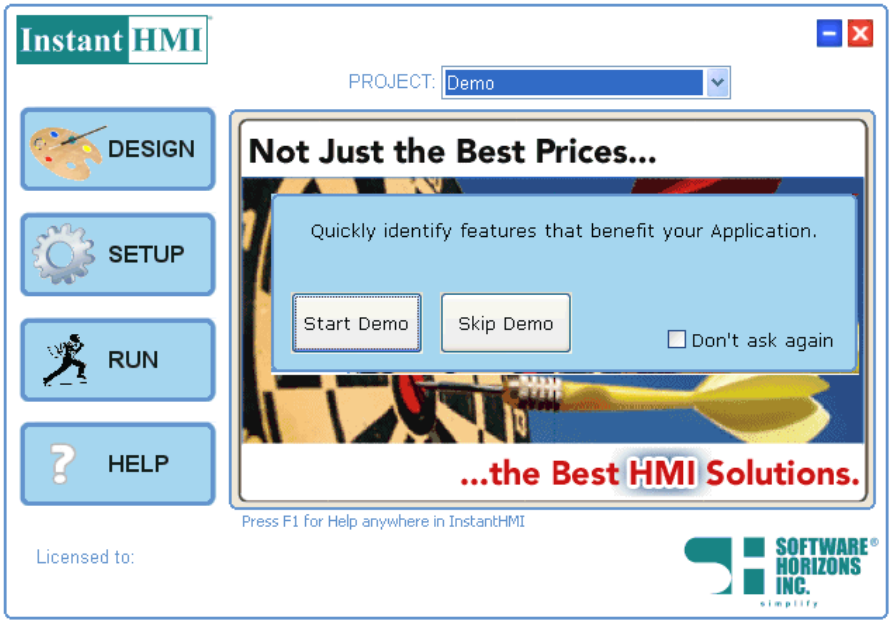


Figure A-22: 'Start Demo' Dialog in LaunchPad

We recommend that you click on 'Start Demo' to get a quick (2-5 minute) review of several InstantHMI features and then Exit the Demo to return to the LaunchPad. Subsequently select the Project 'Quick Start-PC' and Run it to learn about InstantHMI project design which you may adapt to suit your own application (see the companion document 'Quick Start Guide' accessible by clicking the Help button on the LaunchPad).

Note: If you have not viewed the Video Tutorial(s) on InstantHMI (available on www.InstantHMI.com) we urge you to do that now.

A.3.2.4 Update Activation (Evaluation to License)

After initial activation, you will receive a confirmation and the InstantHMI Activation Utility will display the activation Status for selected product. You will notice that the 'Activate Now' button has a new label 'Update Activation'. You may click on 'Update Activation' to upgrade from 'Evaluation Activated' to 'License Activated' or to make any other licensing upgrades.

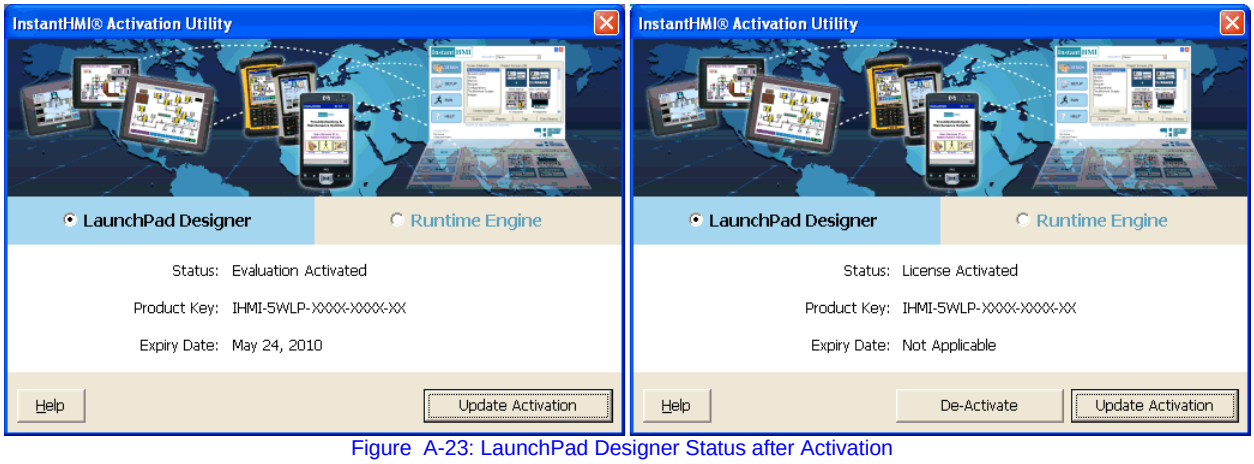


Figure A-23: LaunchPad Designer Status after Activation

When the product License status is 'License Activated', a new button 'De-Activate' appears to the left of 'Update Activation' button. You may click on 'De-Activate' button to remove the License from the PC or to move the License to another PC (Section A.4).

A.3.3 Activation of PC Runtime Engine License

Runtime Engine Activation

We illustrated the Activation process in detail for LaunchPad Designer (Section A.3.2). The Runtime Engine Activation will be similar. When the InstantHMI Activation Utility runs you will see the following dialog.

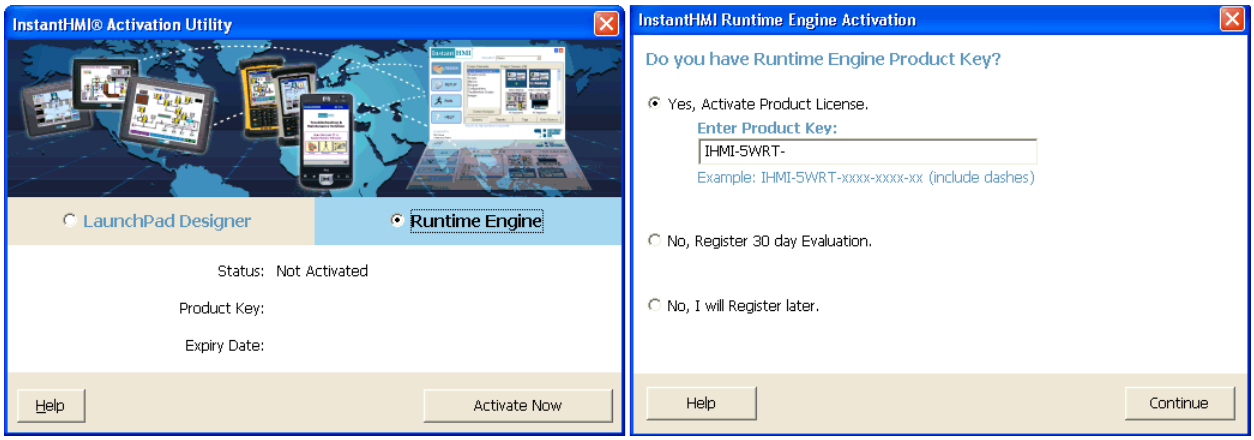


Figure A-24: Selecting and Activating PC Runtime Engine

Select Runtime Engine and click Activate Now. Proceed to activate similar to LaunchPad Designer (Section A.3.2).

A.3.4 Activation of PDA Runtime Engine License

If InstantHMI installation on your PDA (Pocket PC, Windows Mobile or Smartphone) is not activated with an Activation Code from Software Horizons, and you run InstantHMI program, you will see the following screen:

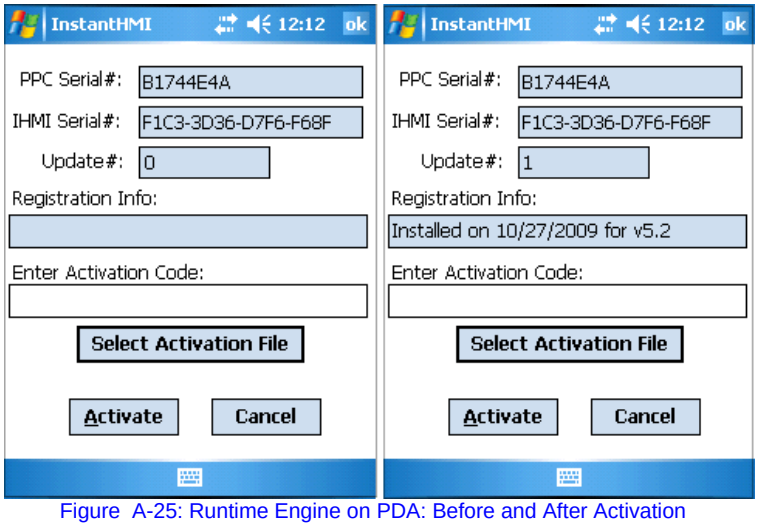


Figure A-25: Runtime Engine on PDA: Before and After Activation

Note down the 16 digit IHMI Serial# displayed on your screen and email to Software Horizons (activate@InstantHMI.com). If you have purchased the Runtime Engine Product License or made other arrangements to receive an Evaluation Activation you will receive an Activation Code from Software Horizons. Enter the Activation Code and click 'Activate'. Activation will enable your InstantHMI program in the PDA hardware for communication with your PLC or other controller. If you do not have an Activation Code tap 'Cancel' button to continue to use InstantHMI in its un-activated Demo mode until you receive the Activation Code from Software Horizons.

Note: Once activated, the Activation Screen will not appear when you run InstantHMI program.

A.3.5 Activation of CE Runtime Engine License

The activation process for CE Runtime Engine is exactly similar to that for PDA Runtime Engine (Section A.3.4).

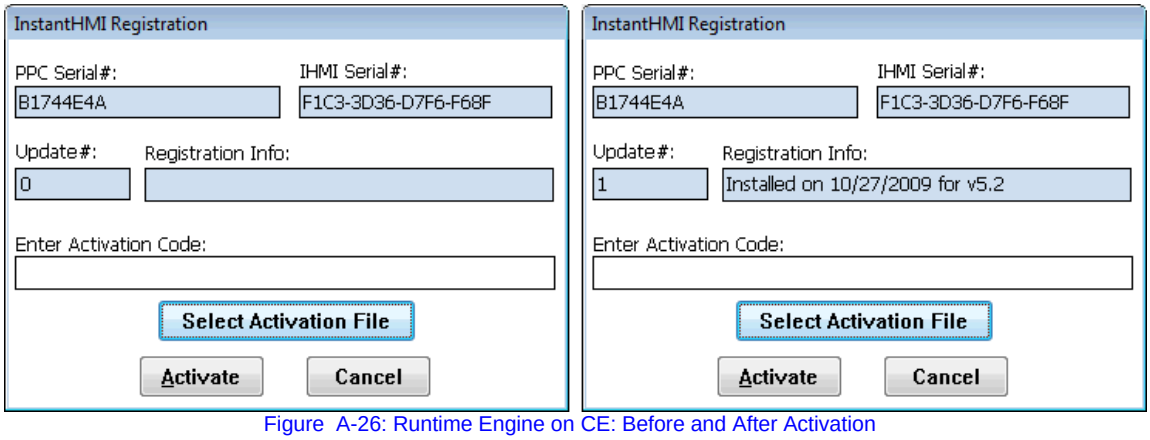


Figure A-26: Runtime Engine on CE: Before and After Activation

A.4 De-Activating InstantHMI Product License

When the product License is activated, the InstantHMI activation Utility displays a new button 'De-Activate' (to the left of 'Update Activation' button, see Figure A-23). The purpose of the 'De-Activate' button is two-fold:

1. Move the License to another PC
2. Remove the License from the PC

We illustrate in detail how to move PC Runtime Engine Activation in Section A.4.1.

A.4.1 Moving License Activation

A.4.1.1 Moving PC Runtime Engine License Activation

Example Scenario: Assume you have valid InstantHMI LaunchPad and Runtime activations on one computer (PC1) and you wish to move the Runtime activation to another computer (PC2). This is usually the case encountered by System Designers who wish to transfer the Runtime activation to the runtime production PC. To accomplish this task, you must carefully follow the steps below.

Caution: In order to move activation, the computer (PC1 in the example) with Runtime Activation must have Internet access. Do not uninstall your software or delete the InstantHMI installation folder (usually C:\IHMI-5). Do not move the activation unless it is necessary, as you might accidentally destroy your activation. Software Horizons may assess a substantial service charge for providing a new activation.

Step 1: Close all InstantHMI programs (LaunchPad Designer, Runtime Engine, etc.)

Step 2: Run the InstantHMI Activation utility from the Start Menu ➔ All Programs ➔ InstantHMI 5.2 Human Machine Interface ➔ InstantHMI Activation Utility. **Select Runtime Engine** in the Activation Utility dialog and then click on De-Activate button. You will see a dialog with two options: Select 'Move License to another PC' and click Continue. This will de-activate Runtime License from PC1 and makes it available to be re-assigned to PC2.

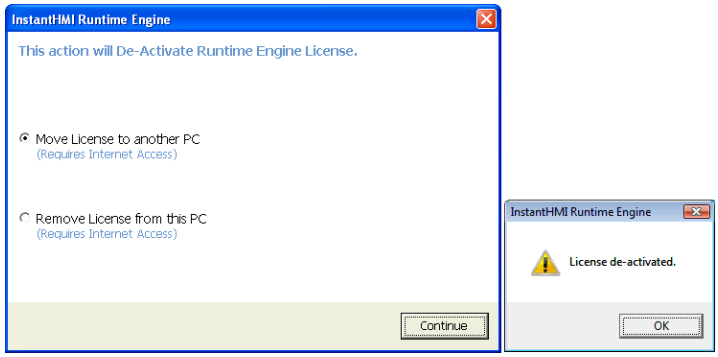


Figure A-27: De-Activating and Moving Runtime License from PC1 to PC2

Step 3: Software Horizons will setup the license activation for Runtime on PC2 and you will be so informed by email.

Step 4: Follow the usual steps (Section A.3.2) to Install and activate product license for Runtime on PC2.

A.4.1.2 Moving PC LaunchPad Designer License Activation

The steps here are similar to that in Section A.4.1. You will select 'LaunchPad' instead of Runtime in Steps 1-4 above.

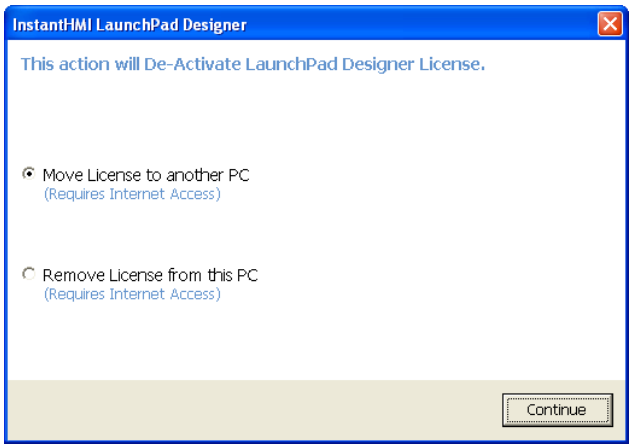


Figure A-28: De-Activating and Moving LaunchPad License from PC1 to PC2

A.4.1.3 Moving CE/PDA Runtime Engine License Activation

Registration Activation of a CE or PDA installation has some restrictions if you are interested in restoring or moving such activation.

InstantChip Software Horizons 'Instant Chip' technology provides pre-activated InstantHMI runtime software (including project files for OEM's) installed on memory cards (CF, SD, mini-SD, micro-SD) and ready for use in compatible hardware (CE Panels and PDA - Pocket PC, Windows Mobile and Smart Phone devices)

InstantChip activations can be moved physically by transferring the memory card from one CE or PDA unit to another. License Activations provided for InstantHMI installations directly on CE or PDA units (without the use of InstantChip) can only be backed up and restored on the same CE or PDA unit as the original installation (Section A.5).

Note: X86 builds of CE Runtime engine allow running from memory card but serial # comes from CE Device. This means the SD card is bound to CE Device and can not be transferred to another CE Device.

A.4.2 Removing License Activation

Note: If requested by Software Horizons De-Activation Confirmation files for Designer and Runtime activations maybe emailed back to us.

A.4.2.1 Removing PC LaunchPad Designer License Activation

The De-activate button (in InstantHMI Activation Utility) also allows you to 'Remove License from the PC'. If you select this option and click Continue, the LaunchPad Designer License activation will be removed permanently from your PC. Removing the activation should only be done if you no longer intend to use LaunchPad Designer and wish to surrender your license.

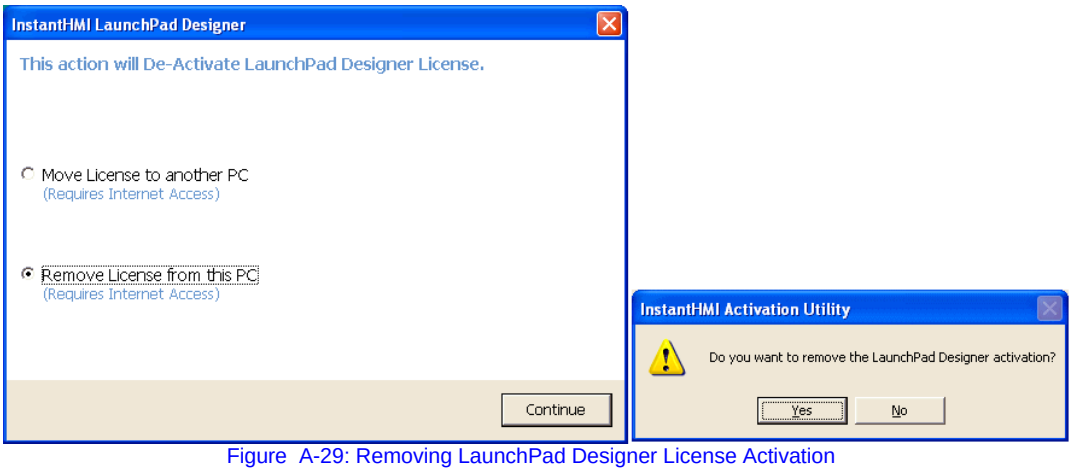


Figure A-29: Removing LaunchPad Designer License Activation

You will receive a confirmation message 'License de-activated' and the Activation Status for LaunchPad Designer will be 'License De-Activated'.

Figure A-30: Status after Removing LaunchPad Designer License Activation

A.4.2.2 Removing PC Runtime Engine License Activation

The procedure is exactly similar to that for LaunchPad Designer (Section A.4.2), except that you will select the product 'Runtime Engine' and then click De-Activate.

A.4.2.3 Removing CE/PDA Runtime Engine License Activation

Only InstantChip activation for your CE / PDA installation, may be surrendered by returning the InstantChip to Software Horizons. Other wise, CE / PDA Runtime activations can not be surrendered. Please contact Software Horizons if you have any questions.

A.5 Backing up InstantHMI Activation

A.5.1 Backing up InstantHMI PDA Activation

Once you have activated the software we recommend that you backup the InstantHMI installation on your PDA. In case you ever have to 'hard reset' your PDA (resulting in the loss of installed InstantHMI software), you can reinstall InstantHMI and then restore the backup files to your PDA. This will avoid the need to re-activate the InstantHMI installation with a new activation code from Software Horizons. Re-activation of InstantHMI will incur a service charge from Software Horizons that can be avoided if you follow the backup procedure in this section. Before starting the backup, make sure that InstantHMI is not running on your PDA.

1. Connect your PDA to your PC and run ActiveSync on your PC.
2. Click the Explore Icon, this will open a "Mobile Device" window.
3. In the Mobile Device Window double-click 'My Device'.

4a. Backing up from PDA (No memory card)
Click and Drag the InstantHMI Folder from the Mobile Device window to your Desktop. This will copy your InstantHMI installation to your PC.

4b. Backing up from PDA (memory card such as SD / CF)
There will be a folder (\SD Card, \CF Card or \Storage Card) corresponding to your Memory Card inserted in the PDA. Double-click the **folder** where InstantHMI is installed. Next, click and drag the InstantHMI Folder from the Mobile Device window to your Desktop. This will copy your InstantHMI installation to your PC.

5. Keep the backed-up InstantHMI folder in a safe, convenient place for easy recovery (for reinstallation if needed) in the future.

> Note
> This backup can only be used to restore InstantHMI to the same physical PDA or Memory Card from which it was backed up. Restoring a backup to a different PDA or Memory Card will invalidate your activation and the software will not function.
>
> InstantChip (activation registration of InstantHMI on memory cards) can be moved from one PDA to another. If you have any questions about backing up or restoring InstantHMI, please contact Software Horizons.

A.5.2 Backing up InstantHMI CE Activation

The process is very similar to that for PDA (Section A.5.1)

A.5.3 Backing up InstantHMI PC Activation

The process is very different for PC as described in Section A.4.

A.6 InstantHMI Activation using USB Key (PC only)

InstantHMI software license (for LaunchPad and or Runtime version 6.1 and later) may be included on a USB Key from Software Horizons.

A.6.1 New InstantHMI Installation

First, Install InstantHMI 6.1. After installation is complete, close any open InstantHMI Programs (LaunchPad Designer, Runtime, etc). Next, connect the USB License Activation Key from Software Horizons to a free USB port on your Windows PC. That's it. You can begin to use InstantHMI in the licensed mode.

NOTE: When you first connect the USB Activation Key, Windows may take some time (several seconds, depending on your OS) to automatically install any necessary drivers. Let this process finish before starting InstantHMI.

A.6.2 Converting Prior Software Activation to USB Activation Key

If you have already purchased and activated an InstantHMI License and are moving to a USB Activation Key you will need to De-Activate your current Licenses (internet connection is required). To de-activate do the following:

A. Start the InstantHMI Activation Utility and choose either LaunchPad Designer or Runtime Engine. Next, click the De-Activate button.

B. Select Remove License from this PC and click Continue to complete the de-activation process.

Repeat steps A and B if you have any remaining InstantHMI license on your PC.

A.6.3 Damaged or Lost Key Policy

Damaged Key: If an InstantHMI USB Activation Key is damaged and no longer functional, please contact Software Horizons to arrange for a replacement. Damaged keys must be returned to Software Horizons to verify a malfunction. Once we have verified the key is non-functional, we will send you a replacement key at a cost of $90. If the key becomes non-functional within 90 days we will usually waive the replacement cost and you pay only for the shipping cost.

Software Horizons can cross-ship a replacement key at your request (a valid Credit Card is required for Cross-Shipping). You must return the non-functional key within 10 days to us; otherwise, you will be charged the full cost of the Software License(s) plus the cost of the Key we cross-shipped to you.

Lost Key: Please keep track of your USB Activation Key(s)! Software Horizons is not responsible for lost/stolen keys. If a key is lost/stolen, NEW license(s) must be purchased as a replacement in addition to the cost of a new key.

B. FAQ - Frequently Asked Questions

B.1 What is 'InstantHMI Designed for OEM'

Software Horizons Inc. offers its services to enhance InstantHMI (Pocket PC, Windows CE or other hardware platforms) to provide additional functionality for OEMs and other customers with special requirements. Such customized versions may include customized databases (Tags, messages, Troubleshoot etc.) and / or additional screens including a startup Menu Screen with buttons tailored to provide the end users easy access to the functions provided by the OEM's product. In addition, the usual InstantHMI Functions for Tag editing, Comm setup etc. are hidden from the end user through Password Protection. The OEM may be provided with special passwords to access these functions to make any desired changes in setup etc. Note: Some OEM versions have restricted availability.

The following special OEM versions are available:

- Temperature Controllers
- Traffic Monitoring
- Semiconductor Equipment Interface
- Application tailored to meet your needs

InstantHMI provides a powerful Project Protection feature to benefit OEMs, System Integrators, and InstantHMI project designers. OEMs and System Integrators will be able to design an InstantHMI project (screens, tag database, etc.) that can **not** be modified by their end users. (See Section 2.4.3)

Please contact Software Horizons with your requirements so we can discuss a mutually beneficial technical and business agreement and create a special OEM version for you.

B.2 Assorted Questions

1. I want to launch my application when the PC starts. How can I do that?

   a) Use Windows Explorer and navigate to the InstantHMI folder (C: IHMI-4 or C:\IHMI-5).
   b) Right click **IHMIRt.exe** (Runtime Engine) and choose Create Shortcut.
   c) Right click the shortcut created and choose Properties.
   d) In the Properties dialog, change the 'Start In' folder to match the path of the InstantHMI Project Folder (e.g. "C:\IHMI-4\YourProjectName") that you want to run.
   e) Copy/Move the Shortcut to your Startup folder in your Windows Start Menu.
   f) When you restart your Windows PC, your InstantHMI application would run automatically.

2. I want to install another InstantHMI PC-node and I want to use a Runtime Engine as tag database server. What do I need to do this?

You will need the TCP-IP Server Option (Part # 43-Win-TCP-Server) to be included with the Runtime Engine (Part #: 40-Win-Std-xx) that will act as the server node. You will also need a standard Runtime Engine (Part #: 40-Win-Std-xx) to be used as the client node.

3. I want to add the tag descriptions to the alarm banner. Is it possible?

   It is not clear what you mean by "alarm banner". Most alarming functions are currently not changeable. There may be changes that Software Horizons can make to InstantHMI to accommodate you. For example: it may be possible to display Tag Descriptions in the "Alarm Object" and store that data into the "Alarm Log". Please call Software Horizons to discuss this further so we can explore your options.

4. I want to log and show historic data. What do I need for this?

There are two components required:
a) To just log data in an ODBC format, use the Datalogging Option (43-Win-DLG-01).
b) To plot trends of historical data logged with the Datalogging Option, use the Historic Trending Option (43-Win-His-Trend).
c) You also have the choice of using the (free) built-in Spooling and Reporting functions. The InstantHMI manual (Section 5) details how to setup reports. You can then import that data (in .CSV format) into Microsoft Excel (or other software) and make your own graphs. Designing reports so that they are compatible with your graphing software is your responsibility.

5. How can I make 'Objects Blink'?

Generally there are two approaches: Alarming and Scripting.

Alarming
You can configure specific tags to check for alarm conditions. When a tag is in alarm, the object(s) associated with it should flash on the screen. Please note, you cannot blink Graphical Object (like a LED). This is useful for text objects on the screen. (You may play a sound file during alarm conditions.)

You can configure alarming by clicking Tag Manager -> Tag Editor -> Setup Alarms Setup the alarm conditions and ensure you check the "Flash Object" checkbox.

Scripting
You can also use scripting to achieve the desired effect. The LED objects allow for a 0 and 1 value. For data that ranges (other than 0 or 1) or for more sophisticated graphical objects you can use Active Bitmaps.

What you want to do is create a script that reads the tag that you want to use for blinking. After reading the tag in the script, you can then decide and program whether or not an object should "blink", how often it should blink, etc. You can then write values (0 or 1 if using a LED object, or any value if using Active Bitmaps) to a Local Tag to simulate blinking of an object. These Local Tag values will be monitored by a LED or Active Bitmap.

6. How can I create 'Momentary Buttons'?

To create a Momentary Button, you may use Touchzones (Section 4.6.5 in the InstantHMI manual). What you do is create two macros. One macro will execute when the Touchzone is pressed and the other will execute when the Touchzone is released. After creating the macros, you will create a Touchzone on the screen. Attach bitmaps to the Touchzone to represent the 'pressed' and 'unpressed' states and then attach the pressed and released macros to the Touchzone. You can see some touchzone examples in the Demo project provided with each PC installation of InstantHMI.

7. I have used InstantHMI Modbus TCP driver several times with Modicon Quantum controllers. However, my new Modbus controller (from another motion drive controller) does not communicate with InstantHMI. What is wrong?

The TCP/IP Push Bit behavior in Windows can affect the communications in certain drivers (example: Modbus TCP). If you find that the communication behavior for your controller is not satisfactory, you may try the following procedure:

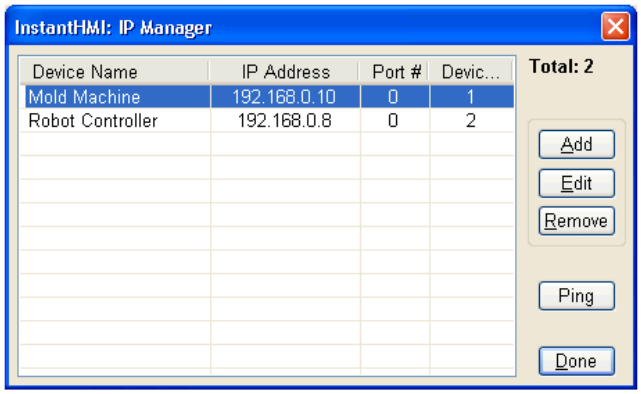
a) Click **Start → Run** and type **regedit** into the Run Window
b) Navigate to **HKEY_LOCAL_MACHINE** by clicking the plus sign to the left of its name
c) Navigate to **SYSTEM**
d) Navigate to **CurrentControlSet**
e) Navigate to **Services**
f) Navigate to **AFD**
g) Click on the **Parameters** folder to select it
h) Click **Edit → New → DWORD Value**
i) Change the name (in the Right-Hand Pane) from New Value #1 to IgnorePushBitOnReceives
j) Double-Click **IgnorePushBitOnReceives** and change the value from **0** to **1**

Exit Regedit and Reboot your PC for the changes to take effect

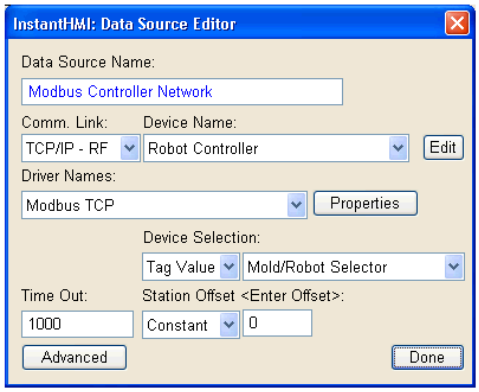
8. How do I select a specific device (Node) on a TCP/IP Network?

Screen objects are associated with tags, which identify the specific memory location in a specific device (controller). Each device on a TCP/IP network has a unique IP address. InstantHMI allows the tags to refer to a specific device directly (as specified in the tag), or indirectly as defined by another Tag which serves as the device selector.

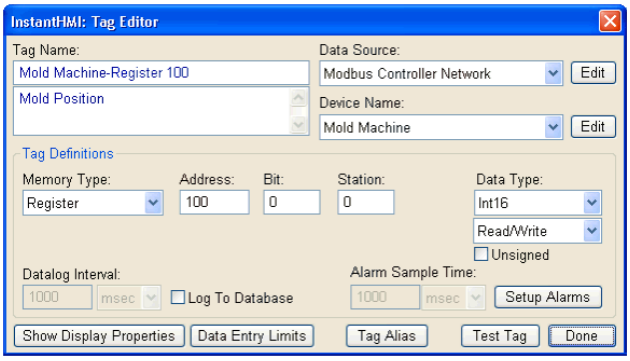
Example:
Our modbus controller network has two devices.
1. 'Mold Machine'
2. 'Robot Controller'



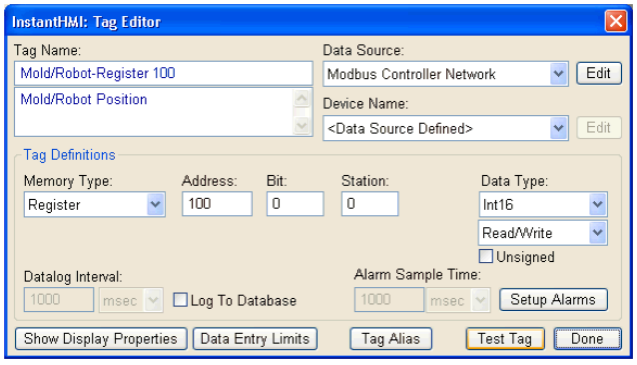
How Data Source identifies the Network Device
The Data Source for the tags has a name ('Robot Controller'). The Data Source also allows the default device selection to be over-ridden based on the value in the tag 'Mold/Robot Selector'. When 'Mold/Robot Selector' tag has the value 1, the Data Source uses device 1 (Mold Machine) for the data and when it has the value 2, the Data Source uses device 2 (Robot Controller) for the data. If the tag 'Mold/Robot Selector' has an undefined value for device selection, then the default device in the Data Source will be used.



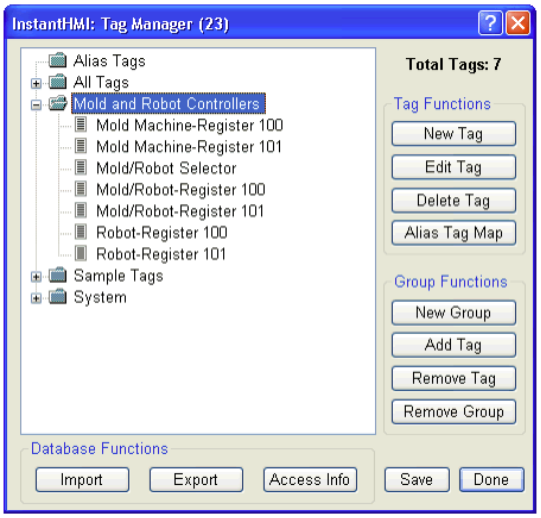
How Tag identifies the Network Device
Whenever a device name is specified in the Tag (example: Mold Machine), it will take precedence over the 'default device' (Robot Controller) in the Data Source.



However, the device name for the tag may be selected to be 'Data Source Defined'. In this case the selection of the device is 'as discussed earlier.



In summary, InstantHMI supports simultaneously the following:
1. tags defined specifically for device 1 'Mold Machine' (2 tags shown),
2. tags defined specifically for device 2 'Robot Controller' (2 tags shown),
3. tags usable for both devices 'Mold/Robot' (2 tags shown) using the third tag 'Mold/Robot Selector' serving as the device selector in the Data Source definition.



9. I plan to have hundreds of messages (dozens of Message Groups, each with several messages). Is there a simple way to manage the text of all these messages and avoid duplications?

For details on creating Message Groups see Section 3.4. You may define all messages for a project collectively in a 'Reference Group' and then let any Message Group define its messages by reference to messages from the reference group.

C. Communication Drivers

For details on driver for your Controller / PLC see Appendix D.XX where xx is the driver number listed in the Driver list below.

Note: A Driver Kit (Comm 00) is available to enable you to write your own 'User Driver'. Multiple User Drivers, each one requiring its own Data Source, are supported.

InstantHMI Driver List **4/1/2010**

Manufacturer	Models	Protocols	Driver	Note
Group 1: Programmable Logic controllers				
Allen Bradley	PLC5, SLC, MicroLogix Series and Compatibles	DF1	33	
	PLC5, SLC, MircoLogix Series	EtherNet/IP (PCCC - DF1)	78	
	Logix 5000 Series, Powerflex VFD AC Drives and Compatibles	EtherNet/IP	78	
Aromat	FP3, FP5	Aromat	35	
Cutler Hammer	D200, D500	Cutler Hammer	10	
CANOpen	CAN Devices	CANOpen	88	1
Direct Logic, Automation Direct	DL05, DL06, DL205, DL305, DL405 and Compatible	Direct Net (CCM2)	07	
	H0/H2/HX-ECOM TCP/IP	Ecom	62	
GE-Fanuc	Series 1, Series 6, Series 90 and Compatible	CCM2	07	
	Series 90	SNP	09	
Honeywell	IPC 620 Series	ABC	22	
IDEC	FA-1J, FA-2J, FA-3S, Micro1	CP11	05	
	FA-3S	CP12	24	
	Micro3 / MicroSmart	Micro3 / MicroSmart	28	
Klockner Moeller	IPC 620 Series	ABC	22	
Koyo	DL205, DL305, DL405 and Compatible	CCM2	07	
	DL05, DL06, DL205, DL405	ECOM	62	2
Matsushita	FP3, FP5	Matsushita	35	
Maxcom	CPUD-04S, S Series	Maxcom	25	
Messung	Various models	Messung	47	
	Nex Gen 4000	Messung	51	
Mitsubishi	A Series	Mitsubishi	17	
	FX Series	Mitsubishi	18	
	FX2N Series	Mitsubishi FX2N	48	
	485 PC-IF (A or FX Series)	Mitsubishi, Format 1	17	
	485 PC-IF (A or FX Series)	Mitsubishi, Format 4	38	
Modicon	184, 384, 484, 584, 884, 984	Modbus RTU	04	
	Momentum Series and all modbus plus Compatibles	Modbus Plus RTU	45	5
	184, 384, 484, 584, 884, 984	Modbus ASCII	04	
	Quantum Series, Momentum Series	Modbus TCP	53	
	Daniel / Enron modbus extensions	Modbus Daniel / Enron	04	
Omni	Omni Flow Computers - Series 3000/6000	Modbus (Enhanced)	59	
Omron	C Series C20H, C200H, CQM1 and others	Omron	08	
OPC Client	OPC 2.0 / 3.0 Compliant Server Software	OPC 2.0 / OPC 3.0	OPC	
PLC Direct	DL05, DL205, DL305, DL405 and Compatibles	Direct Net (CCM2)	07	
Siemens	500, 505 Series	TI	01	
	S5 Series 100U, 115U, 130U, S595U	AS511	12	
	S7 Series 212, 221, 222, 224 and others	PPI	44	
	S7 Series 314 and compatibles. PC Adapter V5.1-Serial RS232	MPI	83	
	S7-200 w/EM-241 module	PPM	60	
SoftPLC	SoftPLC	DF1	33	
Software Horizons	InstantHMI Runtime Engines	InstantHMI Inter-node Link	SHIP	
Square D	Model 50, Micro1	Square D	05	
	Symax 300,400,500,700	Square D	02	
Texas Instruments	500, 505 Series	TI	01	
	300, 400 Series	CCM2	07	
Toshiba	EX100, EX200B, EX250, EX500, M20, M40	Toshiba	10	
	T Series, T1, T2	Toshiba	41	
Unitronics	M90 and Compatibles	ASCII PCOM	54	

	Vision 230 and Compatibles	ASCII PCOM	54	
Wago	Wago-IO System 750-812, 814, 815, 816	Modbus RTU	04	
	Wago-IO System 750-842	Modbus TCP	53	
	Wago-IO Ethernet / IP Compatibles	Ethernet / IP	78	
Westinghouse	PC503 and Compatibles	AS511	12	
Yaskawa	MP-940	Memobus	57	
Zetron	1700 Series (Models # 1708, 1716, etc	Zetron (Ultrac)	68	
Group 2: Other I/O Devices				
APC	Smart UPS (Uninterruptible Power Supply) 1000 and compatibles	Power Monitoring	82	
B&B Electronics	232SDA12 Data Acquisition Module	B&B	58	
Bristol	Bristol RTU 3305 and compatibles	BSAP	80	1
B-Tek	Weighing Scales	B-Tek (Bilanciai)	74	
EDI	Large Banner Display	EDI Protocol	61	
StoneL	AS-i Serial Gateway	Modbus RTU (StoneL)	86	2
	AS-i Ethernet Gateway	Modbus TCP (StoneL)	85	2
UEI	Power DNA Cube	UEI Framework	84	5
Watlow	Watlow SD, 96, F4 and Compatibles Temp Controllers - Serial	Modbus (Enhanced)	04	
	Watlow SD Temp Controllers - Infrared Link	Modbus ASCII (Enhanced)	04	4
	Watlow PD Ethernet / IP Compatibles	EtherNet/IP	78	

Note: 1 = Call for availability, 2 = Not for Palm, 3 = Not for Pocket PC, 4 = For Palm only, 5 = For PC only.

D. Solution for Your Controllers

D.1 Solution for Allen-Bradley Controllers

For training purposes, to explain the design of screens and screen objects independent of the PLC, initially we avoided the use of the PLC and used a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the PLC). This Simulation Approach did not require us to define a Data Source for the Local Memory in the PC Simulation of the PLC; nor did we need to worry about the Communication Link between the Runtime Platform and the PLC. However, to use data registers and I/O from Allen-Bradley PLC (connected by Serial or Ethernet link to PC InstantHMI Runtime Engine) you must define a Data Source for your PLC.

This Appendix may be used for any Allen-Bradley controllers. Please refer to Memory Map for Allen-Bradley MicroLogix are listed in the table below if you wish to implement the Water Supply System control logic in your PLC and define PLC tags.

InstantHMI uses various communication protocols to communicate with the Allen-Bradley PLCs. Section D.1.1 covers the serial DF1 protocol (PLC5 series, SLC series, MicroLogix series). Section D.1.2 covers the Ethernet PCCC-DF1 protocol (including Allen-Bradley MicroLogix, SLC, and PLC-5 using NET-ENI or other appropriate Ethernet interface from Allen-Bradley). Section D.1.3 covers the Logix controllers: ControlLogix, CompactLogix, etc. (see table below).

Allen-Bradley Controllers	Protocol	Runtime Platforms		
		Windows PC	Pocket PC	Windows CE
PLC5, SLC, MicroLogix	Serial DF1	Section D.1.1	Section D.1.1	Section D.1.1
PLC5, SLC, MicroLogix with Net-ENI	EtherNet/IP PCCC-DF1	Section D.1.2	Section D.1.2	Section D.1.2
Logix Controllers, VFD, *	EtherNet/IP	Section D.1.3	Section D.1.3	Section D.1.3

* EtherNet/IP compatible controllers from other vendors.

D.1.1 Allen-Bradley Serial DF1 Protocol

Communication Link

Connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) using a serial cable to your PLC. If wireless link is desired, suitable adapter kits for your PLC (Serial-Infrared, Serial-WiFi, Serial-Bluetooth) are available from Software Horizons.

Data Source

Define the Data Source 'AB DF1 - MicroLogix' as shown in Figure D-1. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name: AB DF1
- Comm Link: Direct Serial
- Port: Com1
- Baud Rate: 19200
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Time Out:: 1000 (msec - default)
- Station Offset:: Constant 0

We have chosen Station Offset: 0 to match the PLC in our setup.

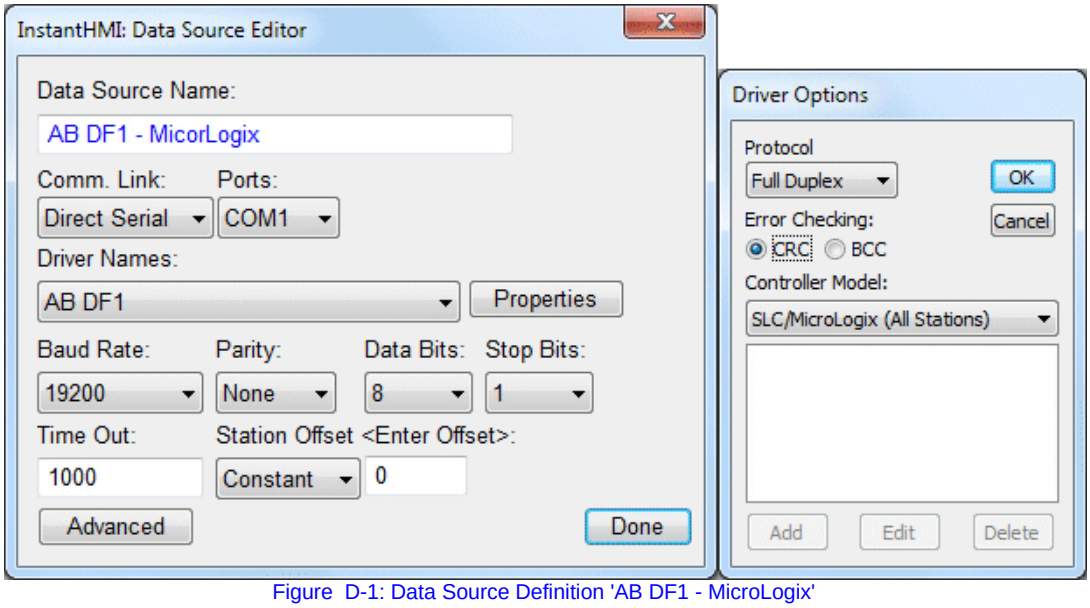


Figure D-1: Data Source Definition 'AB DF1 - MicroLogix'

At this point, the Runtime script still controls the simulation and the old tag definitions can be used without change. You may implement your own logic in the PLC and remove the runtime script from the project for your PLC logic to drive the Water Supply System behavior. To switch to PLC tags, you will need to associate the data source we just defined with each tag in the Tag Database (except Date and Time, which remain Local Memory tags). This automatically associates the screen objects with PLC tags as opposed to the Local memory tags previously used in the simulation. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' of Bar object on screen produces this property
b) Bar Properties: Vertical Bar, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired.
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

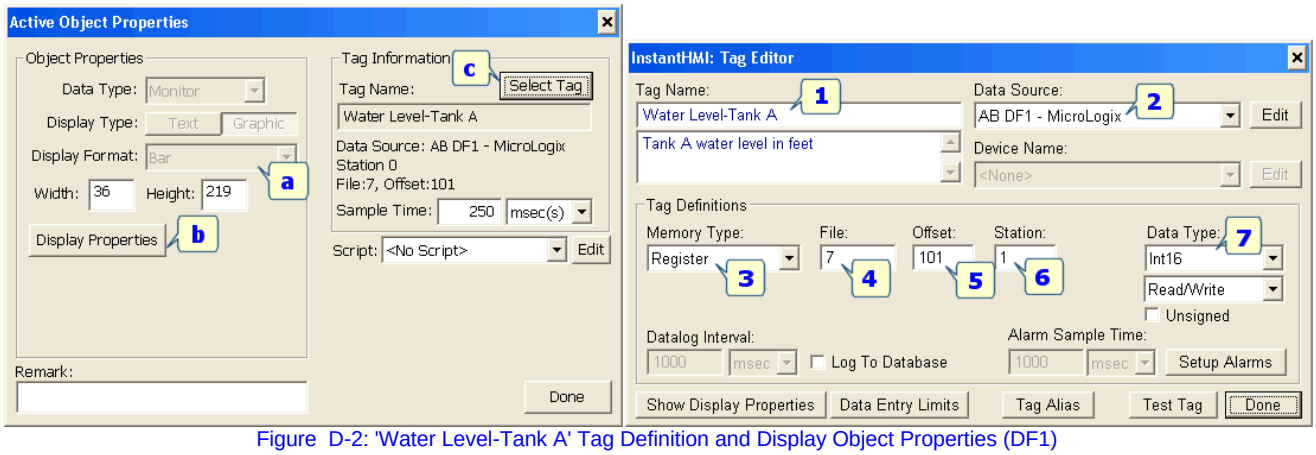


Figure D-2: 'Water Level-Tank A' Tag Definition and Display Object Properties (DF1)

Tank Level Tag Definition

1 Tag Name: 'Water Level - Tank A'
2 Data Source: 'AB DF1 - MicroLogix'
3 Memory Type: 'Register'
4 Address: File '7',
5 Offset: '101'
6 Station: '1' (should match your PLC)
7. Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

The table of Local Memory tags (variables of interest) used in the simulation is repeated below. Note that we have included a column labeled 'PLC Address File: Offset' next to the Local Memory Address column. PLC Address column defines the memory tags in the PLC with matching offsets in the integer file '7'. This re-defines all the tags to suit your PLC.

Tag Name	Data Type	Data Format	Local Memory Address	PLC Address File : Offset	Tag Group Membership
Alarm State - Tank A	Monitor	Integer	102	7: 102	Tank A
Alarm State - Tank B	Monitor	Integer	152	7: 152	Well
Booster Pump Rate	Monitor	Integer	164	7: 164	System
Limit Switch	Monitor	Integer	161	7: 161	System
Lower Limit	Monitor	Integer	166	7: 166	System
Pump Status	Monitor	Integer	168	7: 168	System
Pump Status-Scaled	Monitor	Integer	168	7: 171	System
System Alarm	Monitor	Integer	167	7: 167	System
System Date	Monitor	Date	1		
System Time	Monitor	Time	4		
Upper Limit	Monitor	Integer	165	7: 165	System
Water In Rate	Monitor	Integer	162	7: 162	System
Water Level - Tank A	Monitor	Integer	101	7: 101	Tank A
Water Level - Tank B	Monitor	Integer	151	7: 151	Well
Water Out Rate - Tank A	Monitor	Integer	163	7: 163	System
Water Out Rate - Tank B	Monitor	Integer	169	7: 169	System
Well Run Mode	Monitor	Integer	181	7: 181	System, Tank A, Well
Well Status	Monitor	Integer	182	7: 182	System, Tank A, Well
Well Status-Scaled	Monitor	Integer	170	7: 170	System, Tank A, Well

D.1.2 Allen-Bradley EtherNet/IP (PCCC DF1) Protocol

Allen-Bradley has provided various serial/Ethernet adapters to access their legacy controllers (MicroLogix, PLC5, SLC etc.) in the Ethernet/IP protocol framework using a 'PCCC object' to implement the serial DF1 protocol. We term this Ethernet/IP (PCCC DF1) Protocol. The discussions in Section 5.1 (Allen-Bradley Serial DF1 Protocol) applies here as well. The only changes are as follows:

Communication Link

You connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) over Ethernet link instead of using serial cable. Use appropriate Allen-Bradley modules to connect the legacy controllers on the Ethernet/IP network. If wireless link is desired, suitable adapter kits (Ethernet-Infrared, Ethernet-WiFi) are available from Software Horizons.

Data Source

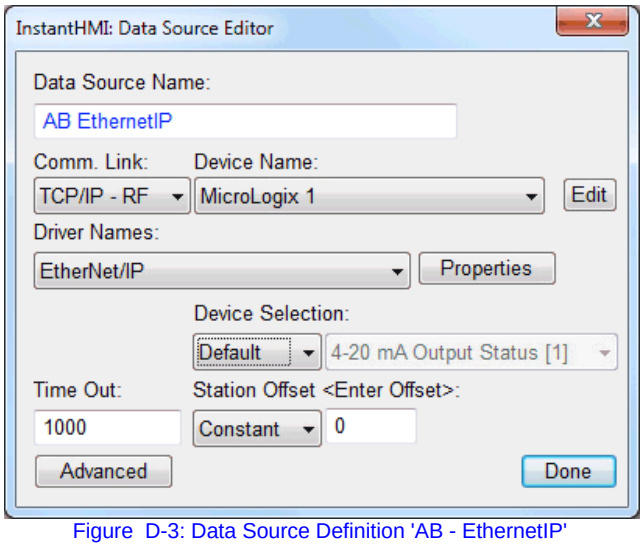


Figure D-3: Data Source Definition 'AB - EthernetIP'

Here the 'AB - EthernetIP ' data source is defined as shown in Figure D-3. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the following:

- Driver Name: Ethernet/IP
- Comm Link: TCP/IP - RF
- Device Name: MicroLogix1
- Time Out: 1000 (msec - default)

Associate this data source with each tag (Note: if you use the old name 'AB DF1 - MicroLogix' - Section D.1.3 - but only change the definition as shown here, then the old tag definitions can be used without change). For illustration, we have used a new Data Source name 'AB - EthernetIP' (to emphasize the Ethernet Link) and changed the data source reference in each tag accordingly. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

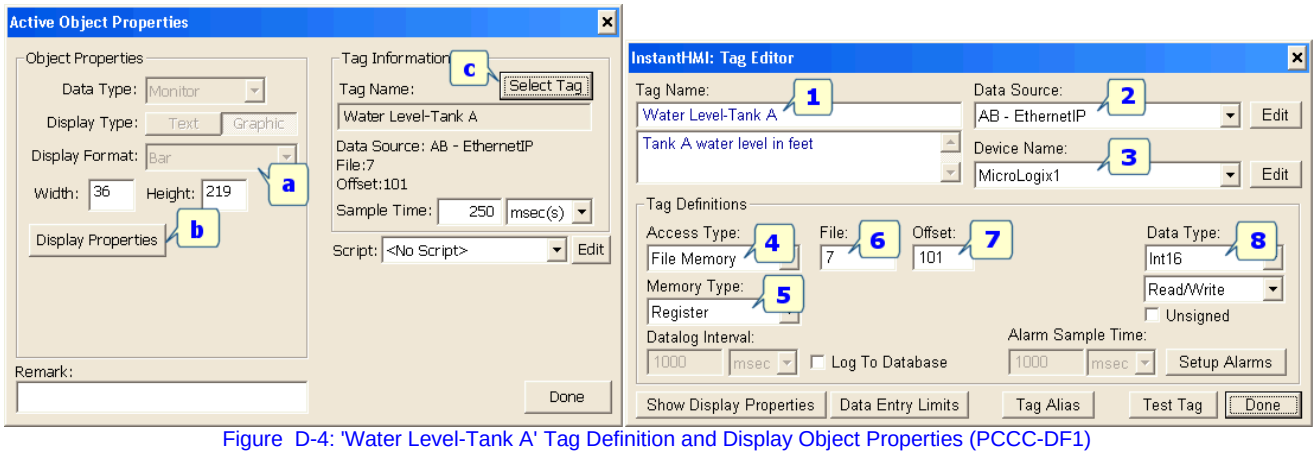


Figure D-4: 'Water Level-Tank A' Tag Definition and Display Object Properties (PCCC-DF1)

Tank Level Tag Definition

1. Tag Name: 'Water Level - Tank A'
2. Data Source: 'AB - EthernetIP'
3. Access Type: 'File Memory'
4. Memory Type: 'Register'
5. Address: File '7',
6. Address: Offset '101'
7. Device Name: 'MicroLogix1' (should match PLC IP Address etc.)
8. Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

D.1.3 Allen-Bradley EtherNet/IP Protocol

Allen-Bradley has provided various Ethernet adapters to access their Logix controllers in the Ethernet/IP protocol framework using Logix Tags. In addition, Allen-Bradley also allows a 'File Mapping' of Logix Tags which enables access to these tags using the legacy 'PCCC Object' approach discussed in Section D.1.2.

Communication Link

You connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) over Ethernet link. Use appropriate Allen-Bradley modules to connect the Logix controllers on the Ethernet/IP network. If wireless link is desired, suitable adapter kits (Ethernet-Infrared, Ethernet-WiFi) are available from Software Horizons.

Data Source

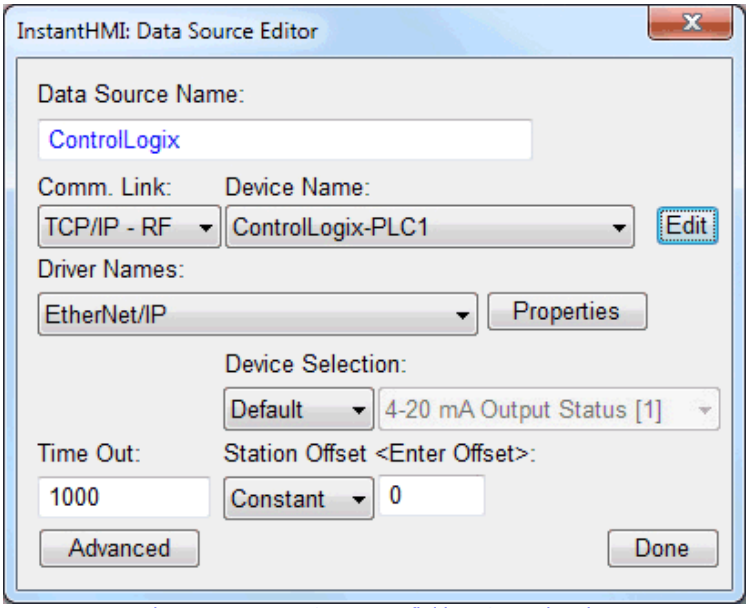


Figure D-5: Data Source Definition 'ControlLogix'

Here the 'ControlLogix' data source is defined as shown Figure D-4. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the following:

- Driver Name: EtherNet/IP
- Comm Link: TCP/IP - RF
- Device Name: ControlLogix-PLC1
- Time Out: 1000 (msec - default)

You define the Data Source 'ControlLogix' as shown and associate this data source with each tag. For illustration, we have used a new Data Source name (to emphasize the Logix controller

Ethernet/IP Link) and changed the data source reference in each tag accordingly. The two ways of accessing Logix tags in ControlLogix PLCs are shown below.

1. Direct Access of Logix Tags: It is only necessary to match the InstantHMI tag names (and data formats) with the tag names in ControlLogix.

2. Memory Mapping (PCCC approach). This approach is similar to that in Section D.1.2.

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

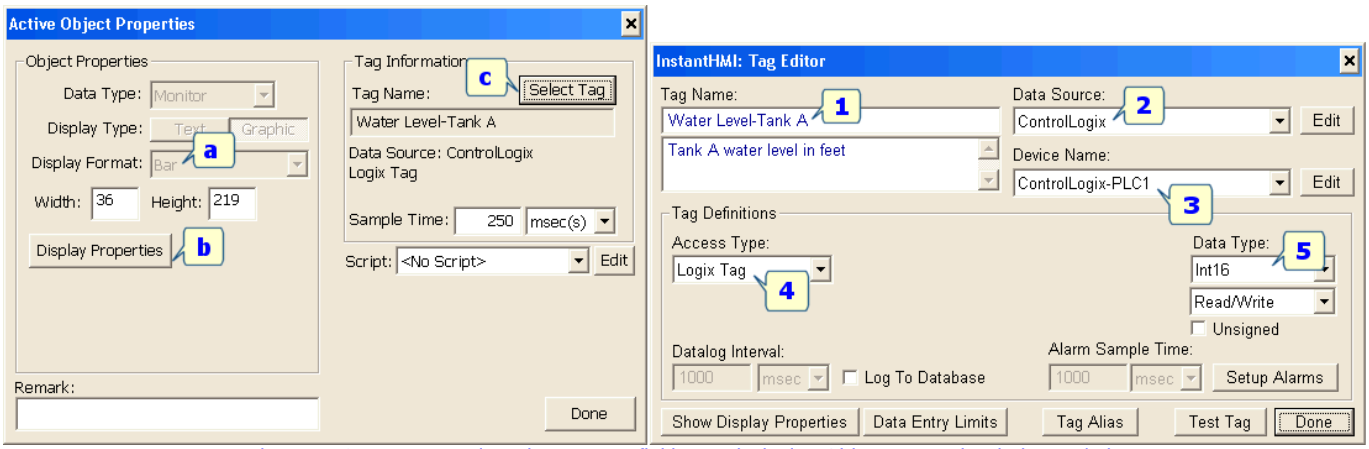


Figure D-6: 'Water Level-Tank A' Tag Definition and Display Object Properties (Ethernet/IP)

Tank Level Tag Definition

1. Tag Name: 'Water Level - Tank A'
2. Data Source: 'ControlLogix'
3. Access Type: 'Logix Tag'
4. Device Name: 'ConrolLogix-PLC1' (should match PLC IP Address etc.)
5. Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

Note:
The discussion on Access Type 'File Memory' in Section D.1.2, Figure D-5 applies to Logix Controllers as well.

D.1.4 Allen-Bradley Communications (Protocols and Drivers)

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with controllers from various manufacturers. This communication may take place using:

- A serial cable link to a serial comm port on your controller.
- An RF link to an RF access point on the controller.
- A TCP/IP link to a TCP/IP compatible controller.
- An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless

RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

> Please note that you must have the proper runtime engine installed on the target platform, and you must Register and Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

Serial DF1 Communication Protocol - Driver 33

> Note: Driver 33 now includes the functionality of the previous Drivers 33, 34 and driver 34 is retired.

The communication link is used to transfer information between the runtime platform and your controller according to the Allen-Bradley DF1 Protocol. These include MicroLogix, SLC, and Allen-Bradley PLC-5 (using KF2 or other appropriate serial interface from Allen- Bradley). The functions implemented in the standard release of InstantHMI Driver 33 are listed in Addressing Section D.1.4. If you need any additional functions please contact Software Horizons.

Setting up your PLC for Proper Communications

InstantHMI uses a default setting of 9600 baud, no parity, 8 data bits, 1 stop bit.

Use this driver to interface with Allen-Bradley SLC 5/01, 5/02, 5/03, 5/04 (channel 0), MicroLogix Series, or DF1 protocol compatible controllers.

Step 1: Follow detailed installation instructions in the Allen-Bradley users manual to set up your PLC, modules and cabling.

Step 2: Make sure the PLC, modules and cables are installed correctly by testing your installation using Allen-Bradley Programming software.

If you choose a lower/higher baud rate, or different Station Number; make sure the InstantHMI Data Source reflects any changes you make. Please see Section D.1.1 of the InstantHMI Manual for more information on how to configure data sources.

Cable Connections

Connect the PLC to the RS-232C port of your runtime platform using the appropriate Allen-Bradley cable for the processor you are communicating with.

For PLC5, you may also use a null-modem adapter with a straight through cable. Alternatively, you may also use AB 1747-CP3 cable or other appropriate Allen-Bradley cable for the processor you are communicating with.

Some PDAs or Windows CE devices may require a converter to communicate with the device (contact Software Horizons for further information).

EtherNet/IP Communication Protocol - Driver 78

> Note: Driver 78 now includes the functionality of this Driver 71, which will be retired soon.

The communication link is used to transfer information between the runtime platform and your controller according to the Allen-Bradley EtherNet/IP protocol for Logix Controllers and PCCC-DF1 protocol for legacy controllers. PCCC-DF1 is the EtherNet/IP adaptation of DF1 protocol to support

Allen-Bradley legacy controllers (including MicroLogix, SLC, and Allen-Bradley PLC-5 - using NET-ENI or other appropriate Ethernet interface from Allen-Bradley). The functions implemented in the standard release of InstantHMI Driver 78 for PCCC-DF1 are listed in Addressing Section D.1.4. If you need any additional functions please contact Software Horizons.

Setting up your PLC for Proper Communications

Use this driver to interface with Allen-Bradley EtherNet/IP PCCC-DF1 protocol compatible controllers (including Allen-Bradley MicroLogix, SLC, and PLC-5 - using NET-ENI or other appropriate Ethernet interface from Allen-Bradley). For ControlLogix controllers you may employ a PLC5 style memory mapping of the Logix controller tags or use Access Type 'Logix Tags'.

Step 1: Follow detailed installation instructions in the Allen-Bradley user manuals to set up your PLC, modules, and cabling.

Step 2: Make sure the PLC, modules, and cables are installed correctly by testing your installation using Allen-Bradley Programming software.

Please see Sections D.1.2, D.1.3 for more information on how to configure data sources.

Cable Connections

Follow detailed installation instructions in the Allen-Bradley user manuals to set up your PLC, modules, and cabling. Some PDAs or Windows CE devices may require an adapter to communicate with the device (contact Software Horizons for further information).

Addressing

Access Type: File Memory Mapping

InstantHMI implements the Allen-Bradley Serial DF1 and Ethernet PCCC-DF1 protocol using the standard AB file structures memory map. The Table below illustrates the functions implemented in the standard release of InstantHMI Allen-Bradley driver along with example addresses. If you need any additional functions please contact Software Horizons.

Allen-Bradley		InstantHMI Data Specification				
Memory Type	PLC Address	Memory Type	Address File	Address Offset	Address Bit	Remarks
Register	N7:1	Register	7	1	N/A	Read or write word (Integer File)
Bit	B3:1/2 or B3/18 ***	Bit	3	1	2	Read or write bit value (Binary file)
Float	N8:1	Register	8	1	N/A	Read or write floats (Float File)
Timer-Preset	T4:1	Timer-Preset	4	1	N/A	Read or write Presets of Timer
Timer-Current	T4:1	Timer-Current	4	1	N/A	Read Timer value
Counter-Preset	C5:0	Counter-Preset	5	0	N/A	Read or write Presets of Counter
Counter-Current	C5:0	Counter-Current	5	0	N/A	Read Counter value
Input	I1:0/1 ***	Digital Input	1	0	1	Read value of Input
Output	O0:0/5 ***	Digital Output	0	0	5	Read or write value of Output
*** Note: The address B3:1/2 is equivalent to B3/18. Similarly, B3:m/n is equivalent to B3/(16*m+n).						

Access Type: Logix Tag

Logix tags may be addressed directly using their tag names (and matching data formats) in InstantHMI.

Name	Alias For	Base Tag	Data Type	Style
AlarmState_TankA			INT	Decimal
AlarmState_TankB			INT	Decimal
BoosterPumpRate			INT	Decimal
LimitSwitch			INT	Decimal
LowerLimit			INT	Decimal
PumpStatus			INT	Decimal
PumpStatus_Scaled			INT	Decimal
SystemAlarm			INT	Decimal
UpperLimit			INT	Decimal
WaterInRate			INT	Decimal
WaterLevel_TankA			INT	Decimal
WaterLevel_TankB			INT	Decimal
WaterOutRate_TankA			INT	Decimal
WaterOutRate_TankB			INT	Decimal
WellRunMode			INT	Decimal
WellStatus			INT	Decimal
WellStatus_Scaled			INT	Decimal

For Logix tags included in your program logic (but not in the controller tag database) specify the InstantHMI Tag Name as follows: PROGRAM: <ProgramName>.<Logix Tag Name>.

Access Type: Object Attributes

CIP Classes and Instances supporting the GetAttributeSingle and SetAttributeSingle services can be accessed using the 'Object Attribute' Access Type. To create a Tag referencing a Class Attribute select Object Attribute from the Access Type pull down menu, and in the fields below specify the Class ID, Instance ID, and Attribute ID. If the attribute is a Class Attribute then specify the Instance ID as zero.

As an example we will create a Tag referencing the 'Preset Speed 1' parameter of an AB PowerFlex 70 variable frequency drive using the Parameter Object Class (Class ID 15). In the case of the PowerFlex the parameter number represents the Parameter Object instance containing the parameter data (PowerFlex manuals document the Parameter IDs of each accessible parameter). 'Preset Speed 1' is parameter number 101. Parameter Object Instance Attribute 1 contains the data value for the parameter. The tag specification for the 'Preset Speed 1' attribute is as follows:

Access Type: Object Attribute
Class ID: 15
Instance ID: 101
Attribute ID: 1

D.2 Solution for Modbus Controllers

For training purposes, to explain the design of screens and screen objects independent of the PLC, initially we avoided the use of the PLC and used a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the PLC). This Simulation Approach did not require us to define a Data Source for the Local Memory in the PC Simulation of the PLC; nor did we need to worry about the Communication Link between the Runtime Platform and the PLC. However, to use data registers and I/O from Modbus PLC (connected by Serial or Ethernet link to PC InstantHMI Runtime Engine) you must define a Data Source for your PLC.

This Appendix may be used for any Modbus controllers. Please refer to Memory Map for Modbus PLC (Addressing Section D.2.3) if you wish to implement the Water Supply System control logic in your PLC and define PLC tags.

InstantHMI uses various communication protocols to communicate with the Modbus PLCs. Section D.2.1 covers the serial ModbusRTU/Ascii protocol. Section D.2.2 covers the Ethernet Modbus -TCP protocol.

D.2.1 Modbus Serial RTU/Ascii Protocol

Communication Link

Connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) using a serial cable to your PLC. If wireless link is desired, suitable adapter kits for your PLC (Serial-Infrared, Serial-WiFi, Serial-Bluetooth) are available from Software Horizons.

Data Source

Define the Data Source 'ModbusRTU' as shown in Figure D-7. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name: Modbus
- Comm Link: Direct Serial
- Port: Com1
- Baud Rate: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Time Out: 1000 (msec - default)
- Station Offset: 0

We have chosen Station Offset: 0 to match the PLC in our setup. In addition, in the driver properties we have selected Comm Mode to be RTU (as opposed to Ascii). Other driver options may be chosen to suit your own controller.

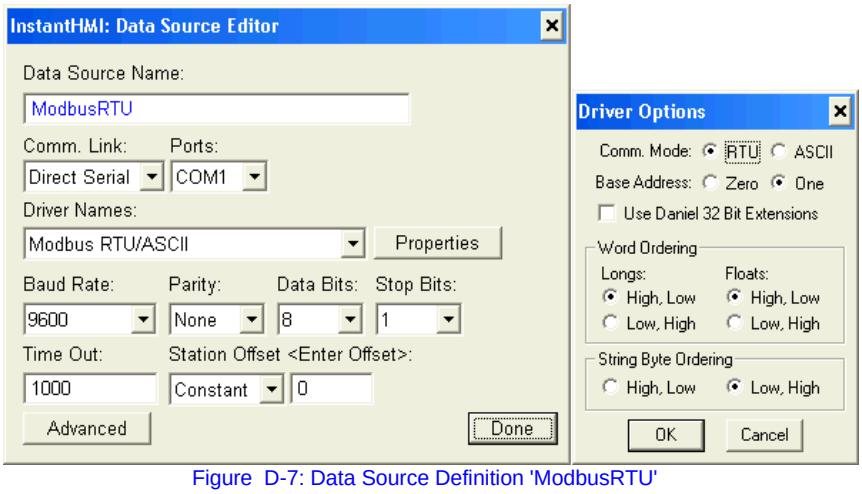


Figure D-7: Data Source Definition 'ModbusRTU'

At this point, the Runtime script still controls the simulation and the old tag definitions can be used without change. You may implement your own logic in the PLC and remove the runtime script from the project for your PLC logic to drive the Water Supply System behavior. To switch to PLC tags, you will need to associate the data source we just defined with each tag in the Tag Database (except Date and Time, which remain Local Memory tags). This automatically associates the screen objects with PLC tags as opposed to the Local memory tags previously used in the simulation. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

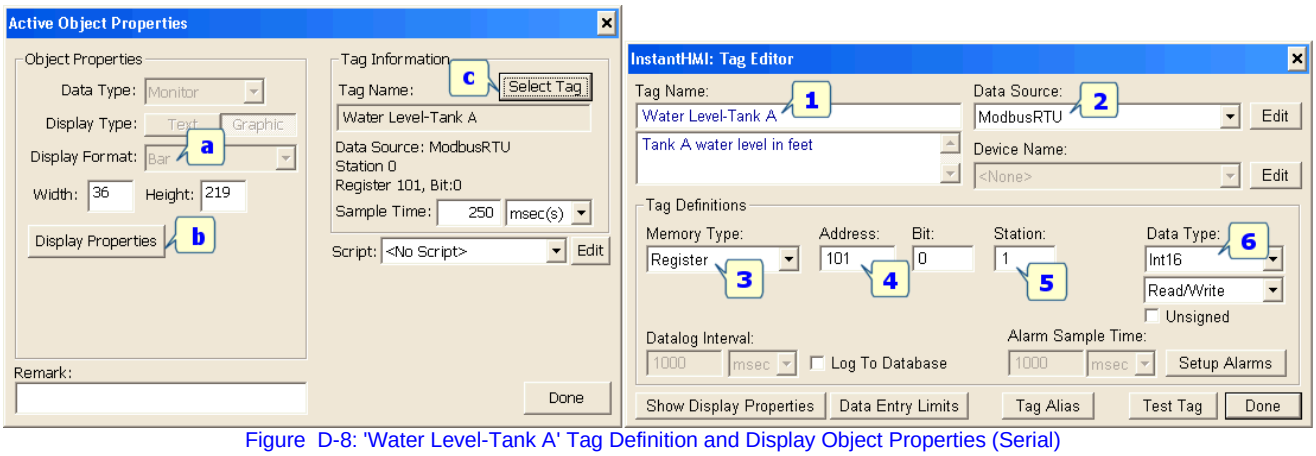


Figure D-8: 'Water Level-Tank A' Tag Definition and Display Object Properties (Serial)

Tank Level Tag Definition

1 Tag Name: 'Water Level -Tank A'
2 Data Source: 'ModbusRTU'
3 Memory Type: 'Register'
4 Address: 101
5 Station: '1' (should match your PLC)
6 Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

The table of Local Memory tags (variables of interest) used in the simulation is repeated below. Note that we have included a column labeled 'PLC Address' next to the Local Memory Address column. PLC Address column defines the register memory tags in the PLC. This re-defines all the tags to suit your PLC.

Tag Name	Data Type	Data Format	Local Memory Address	PLC Address Register	Tag Group Membership
Alarm State - Tank A	Monitor	Integer	102	400102	Tank A
Alarm State - Tank B	Monitor	Integer	152	400152	Well
Booster Pump Rate	Monitor	Integer	164	400164	System
Limit Switch	Monitor	Integer	161	400161	System
Lower Limit	Monitor	Integer	166	400166	System
Pump Status	Monitor	Integer	168	400168	System
Pump Status-Scaled	Monitor	Integer	168	400171	System
System Alarm	Monitor	Integer	167	400167	System
System Date	Monitor	Date	1		
System Time	Monitor	Time	4		
Upper Limit	Monitor	Integer	165	400165	System
Water In Rate	Monitor	Integer	162	400162	System
Water Level - Tank A	Monitor	Integer	101	400101	Tank A
Water Level - Tank B	Monitor	Integer	151	400151	Well
Water Out Rate - Tank A	Monitor	Integer	163	400163	System
Water Out Rate - Tank B	Monitor	Integer	169	400169	System
Well Run Mode	Monitor	Integer	181	400181	System, Tank A, Well
Well Status	Monitor	Integer	182	400182	System, Tank A, Well
Well Status-Scaled	Monitor	Integer	170	400170	System, Tank A, Well

D.2.2 Modbus TCP Protocol

The discussion in Section D.2.1 (Modbus Serial RTU/Ascii Protocol) applies here as well. The only changes are as follows:

Communication Link

You connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) over Ethernet link instead of using serial cable. If wireless link is desired, suitable adapter kits (Ethernet-Infrared, Ethernet-WiFi) are available from Software Horizons.

Data Source

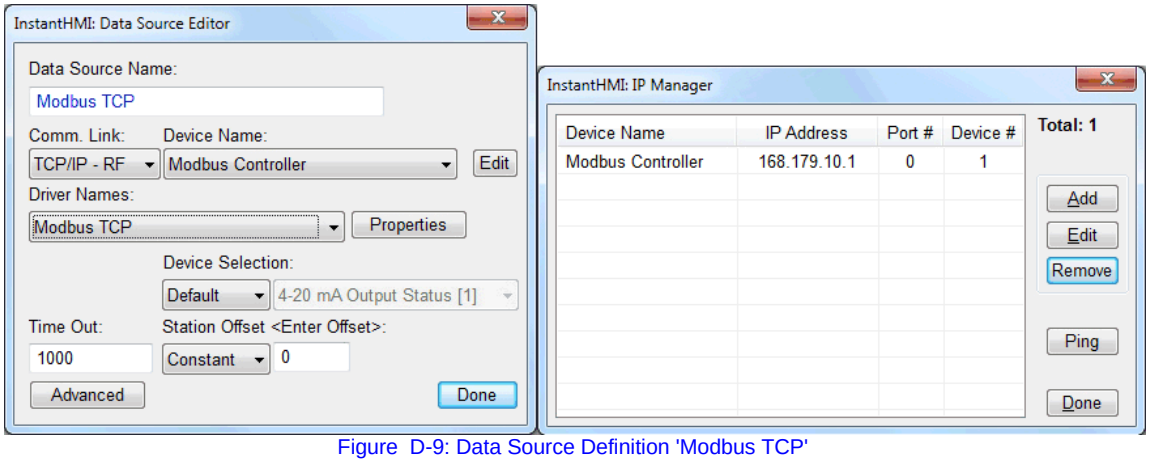


Figure D-9: Data Source Definition 'Modbus TCP'

Here the 'Modbus TCP ' data source is defined as shown in Figure D-9. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the following:

- Driver Name: Modbus TCP
- Comm Link: TCP/IP - RF
- Device Name: Modbus Controller
- Time Out: 1000 (msec - default)

Associate this data source with each tag (Note: if you use the old name 'Modbus RTU' - Section D.2.1- but only change the definition as shown here, then the old tag definitions can be used without change). For illustration, we have used a new Data Source name 'Modbus TCP' (to emphasize the

Ethernet Link) and changed the data source reference in each tag accordingly. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

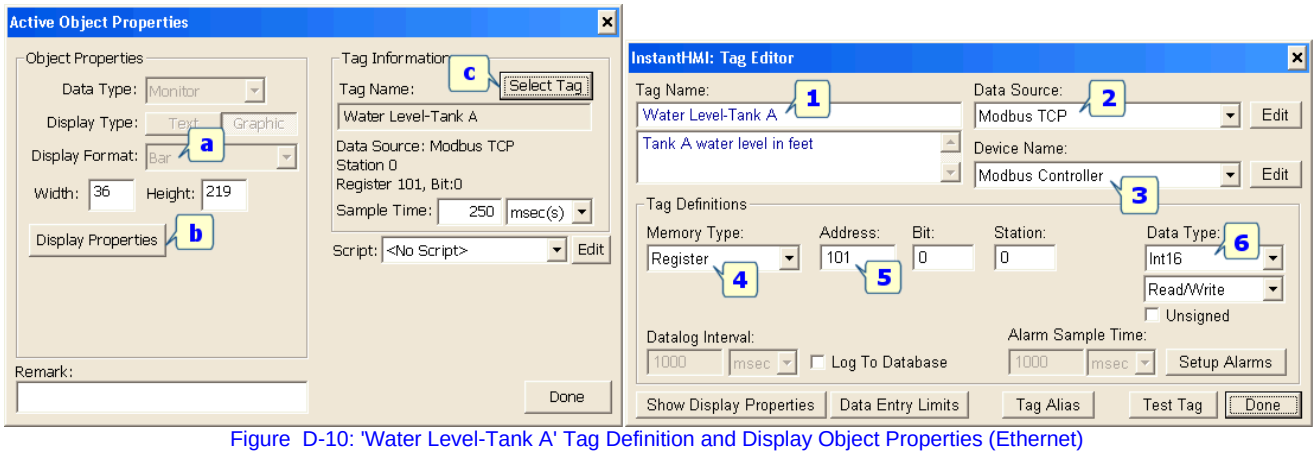


Figure D-10: 'Water Level-Tank A' Tag Definition and Display Object Properties (Ethernet)

Tank Level Tag Definition

1. Tag Name: 'Water Level - Tank A'
2. Data Source: 'Modbus TCP'
3. Memory Type: 'Register'
4. Address: '101',
5. Device Name: 'Modbus Controller' (should match PLC IP Address etc.)
6. Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

D.2.3 Modbus Communications (Protocols and Drivers)

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with controllers from various manufacturers. This communication may take place using:

- A serial cable link to a serial comm port on your controller.
- An RF link to an RF access point on the controller.
- A TCP/IP link to a TCP/IP compatible controller.
- An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

> Please note that you must have the proper runtime engine installed on the target platform, and you must Register and Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

Modbus RTU/Ascii Communication Protocol-Driver 04

Note: Driver 04 now includes the functionality of the previous Drivers 04, 40, 49 and 50. Drivers 40, 49, and 50 are retired. Modbus Drivers 04, 53, 59, 85, and 86 have been updated to allow selection of function code for writing registers using 0x06 or 0x10 function codes in the setup dialog.

Version 6.1.17 B4007 on include an Inter-Frame Delay that can be customized by the user as necessary. This is a 3 ½ character delay in standard modbus and could be as much as 25 msec delay before each comm request for some controllers (Watlow SD Controller).

The communication link is used to transfer information between the runtime platform and your controller according to Modbus RTU/ASCII protocols. These include most Modicon controllers, and controllers from other manufacturers such as Watlow, Wago etc. The functions implemented in the standard release of InstantHMI Drivers 04 (Modbus RTU), 40 (Modbus RTU Enhanced), 49 (Modbus ASCII), and 50 (Modbus ASCII Enhanced) are listed in Addressing Section D.2.3. If you need any additional functions please contact Software Horizons.

Setting up your PLC for Proper Communications

InstantHMI uses a default setting of 9600 baud, no parity, 8 data bits, 1 stop bit. The Station Number is configurable via PLC configuration software (factory default is usually 1).

Use this driver to interface with Modbus RTU or Ascii protocol compatible controllers.

Step 1: Follow detailed installation instructions for your controller users manual to set up your PLC, modules and cabling.

Step 2: Make sure the PLC, modules and cables are installed correctly by testing your installation using Controller Programming software.

If you choose a lower/higher baud rate, or different Station Number; make sure the InstantHMI Data Source reflects any changes you make. Please see Section D.2.1 of this Manual for more information on how to configure data sources.
If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your data source can be edited by tapping Setup -> Comm Setup from the InstantHMI Main Menu on your PDA (See Section 3.1 in the InstantHMI Manual for more information).

Serial Cable Connections

Connect the PLC to the RS-232C port of your runtime platform using a standard RS-232 Cable. Some PDAs or Windows CE devices may require a converter to communicate with the device (contact Software Horizons for further information).

Modbus TCP Communication Protocol-Driver 53

The communication link is used to transfer information between the runtime platform and your controller according to Modbus TCP protocol. The functions implemented in the standard release of InstantHMI Driver 53 (Modbus TCP) are listed in are listed in the table below.

Modbus Plus Communication Protocol-Driver 45

The communication link is used to transfer information between the runtime platform and your controller according to Modbus Plus protocol. The functions implemented in the standard release of InstantHMI Driver 45 (Modbus Plus) are listed in are listed in the table below.

Addressing (Memory Mapping)

InstantHMI implements the Modbus protocol using the RTU/ASCII/TCP transmission modes. The Table below illustrates the functions implemented in the standard release of InstantHMI Modbus driver along with example addresses. If you need any additional functions please contact Software Horizons.

Modbus Compatible Device			InstantHMI Data Specification		
Memory Type	**PLC Address**	**Function**	**Memory Type**	**InstantHMI Address**	**Function**
Internal Holding Register or Physical Output Register	4xxxxx	03	Register or Analog Output	xxxxx	Read Modbus Memory Type
Internal Register or Physical Output Register	4xxxxx	06	Register or Analog Output	xxxxx	Write Modbus Memory Type
Internal Bit or Physical Coil	0xxxxx	01	Bit or Digital Output	xxxxx	Read Modbus Memory Type
Internal Bit or Physical Coil	0xxxxx	05	Bit or Digital Output	xxxxx	Write Modbus Memory Type
Physical Discrete Input	1xxxxx	02	Digital Input	xxxxx	Read Modbus Memory Type
Physical Input Register	3xxxxx	04	Analog Input	xxxxx	Read Modbus Memory Type

Note: While defining the Data Source for your controller, you may click on the 'Properties' button to change the default parameters we have selected for the 'Driver Options' for the modbus controller. If your controller differs from the standard modbus PLC, you may change the Driver Options to suit your controller. For example, you may select the base address (for registers) to be Zero or One to ensure that the addressing suggested above matches your PLC. In addition, Word Ordering (Byte swapping) may be selected to match the scheme for your controller. Some controllers support the Daniel 32-Bit extensions to the standard Modbus protocol to be used with Floating point values in the controller. The best way to define the Data Source for your controller is setup a test screen with relevant input and monitor fields, use the default setup for 'Driver Options' and verify if the result for your controller is what you expect. If not, make the necessary adjustments in the 'Driver Options' dialog and re-test to ensure that your test screen produces the expected results.

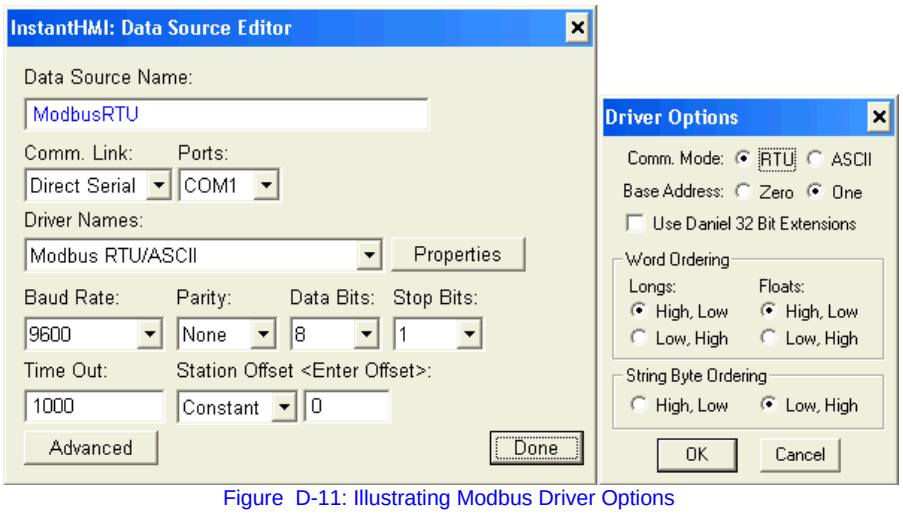


Figure D-11: Illustrating Modbus Driver Options

Addressing Examples

These examples assume that Discrete Inputs 1-16 are mapped to 000001-000016 and Discrete Outputs 1 and 2 are mapped to the 000050-000051 ranges (contacts/coils) using your PLC software.

Note:
Depending on your controller, the mapping of Discrete Inputs may cause the Inputs to be mapped in reverse order. For Example Discrete Input 1 would be mapped to 000016, Discrete Input 2 would be mapped to 000015, Discrete Input 16 would be mapped to 000001 etc. The examples below, assume this is the case.

Modbus Compatible Device		**InstantHMI Data Specification**			
Memory Type	**Address**	**Data Format**	**Memory Type**	**Address**	**Bit Number**
Holding Register	400100	Integer	Register or Analog Output	100	0
Discrete Input 1	000016	Boolean	Digital Input	16	0
Discrete Input 2	000015	Boolean	Digital Input	15	0
Discrete Input 16	000001	Boolean	Digital Input	1	0
Internal Bit	000100	Boolean	Bit or Digital Output	100	0
Discrete Output 1	000050	Boolean	Bit or Digital Output	50	0
Analog Input 1	300001	Integer	Analog Input	1	0
Analog Output 3	400003	Integer	Register	3	0

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D.3 Solution for Koyo - DirectLogic PLC

For training purposes, to explain the design of screens and screen objects independent of the PLC, initially we avoided the use of the PLC and used a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the PLC). This Simulation Approach did not require us to define a Data Source for the Local Memory in the PC Simulation of the PLC; nor did we need to worry about the Communication Link between the Runtime Platform and the PLC. However, to use data registers and I/O from DirectLogic PLC (connected by Serial or Ethernet link to PC InstantHMI Runtime Engine) you must define a Data Source for your PLC.

This Appendix may be used for any Koyo / DirectLogic / Automation Direct controllers. Please refer to Memory Map for DirectLogic PLC (Addressing Section D.3.3) if you wish to implement the Water Supply System control logic in your PLC and define PLC tags.

InstantHMI uses two different communication protocols to communicate with the Direct Logic PLCs. Section D.3.1 covers the serial DirectNet/CCM2 protocol. Section D.3.2 covers the Ecom - Ethernet protocol.

D.3.1 Koyo Direct Net/CCM2 Serial Protocol

Communication Link

Connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) using a serial cable to your PLC. If wireless link is desired, suitable adapter kits for your PLC (Serial-Infrared, Serial-WiFi, Serial-Bluetooth) are available from Software Horizons.

Data Source

Define the Data Source ' DirectLogic Serial' as shown in Figure D-12. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name: CCM2 - DirectNet
- Comm Link: Direct Serial
- Port: Com1
- Baud Rate: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Time Out: 1000 (msec - default)
- Station Offset: 0

We have chosen Station Offset: 0 to match the PLC in our setup. Other driver options may be chosen to suit your own controller.

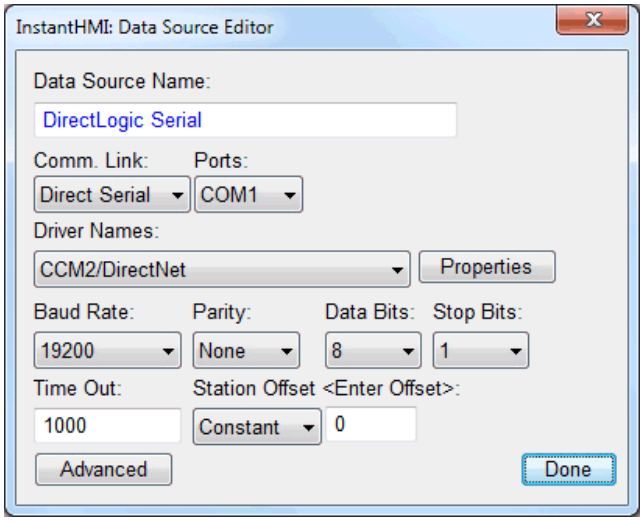

Figure D-12: Data Source Definition ' DirectLogic Serial '

At this point, the Runtime script still controls the simulation and the old tag definitions can be used without change. You may implement your own logic in the PLC and remove the runtime script from the project for your PLC logic to drive the Water Supply System behavior. To switch to PLC tags, you will need to associate the data source we just defined with each tag in the Tag Database (except Date and Time, which remain Local Memory tags). This automatically associates the screen objects with PLC tags as opposed to the Local memory tags previously used in the simulation. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

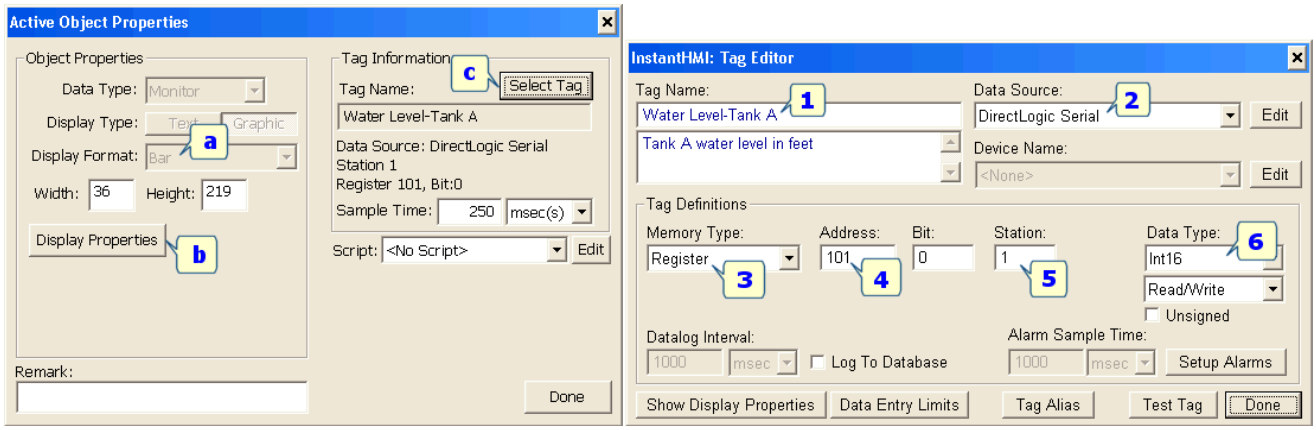

Figure D-13: 'Water Level-Tank A' Tag Definition and Display Object Properties (Serial)

Tank Level Tag Definition

1 Tag Name: 'Water Level -Tank A'
2 Data Source: 'DirectLogic Serial'
3 Memory Type: 'Register'
4 Address: 101
5 Station: '1' (should match your PLC)
6 Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

The table of Local Memory tags (variables of interest) used in the simulation is repeated below. Note that we have included a column labeled 'PLC Address' next to the Local Memory Address

column. PLC Address column defines the register memory tags in the PLC. This re-defines all the tags to suit your PLC (Example: DirectLogic).

Tag Name	Data Type	Data Format	Local Memory Address (Dec)	PLC Address Register (Oct)	Tag Group Membership
Alarm State - Tank A	Monitor	Integer	102	1441	Tank A
Alarm State - Tank B	Monitor	Integer	152	1667	Well
Booster Pump Rate	Monitor	Integer	164	1703	System
Limit Switch	Monitor	Integer	161	1700	System
Lower Limit	Monitor	Integer	166	1705	System
Pump Status	Monitor	Integer	168	1707	System
Pump Status-Scaled	Monitor	Integer	168	1712	System
System Alarm	Monitor	Integer	167	1706	System
System Date	Monitor	Date	1		
System Time	Monitor	Time	4		
Upper Limit	Monitor	Integer	165	1704	System
Water In Rate	Monitor	Integer	162	1701	System
Water Level - Tank A	Monitor	Integer	101	1440	Tank A
Water Level - Tank B	Monitor	Integer	151	1666	Well
Water Out Rate - Tank A	Monitor	Integer	163	1702	System
Water Out Rate - Tank B	Monitor	Integer	169	1710	System
Well Run Mode	Monitor	Integer	181	1724	System, Tank A, Well
Well Status	Monitor	Integer	182	1725	System, Tank A, Well
Well Status-Scaled	Monitor	Integer	170	1711	System, Tank A, Well

D.3.2 Koyo Ecom - Ethernet Protocol

The discussions in Section D.3.1 (DirectNet/CCM2 Serial Protocol) applies here as well. The only changes are as follows:

Communication Link

You connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) over Ethernet link using the Ecom module at the PLC end instead of using serial cable. If wireless link is desired, suitable adapter kits (Ethernet-Infrared, Ethernet-WiFi) are available from Software Horizons.

Data Source

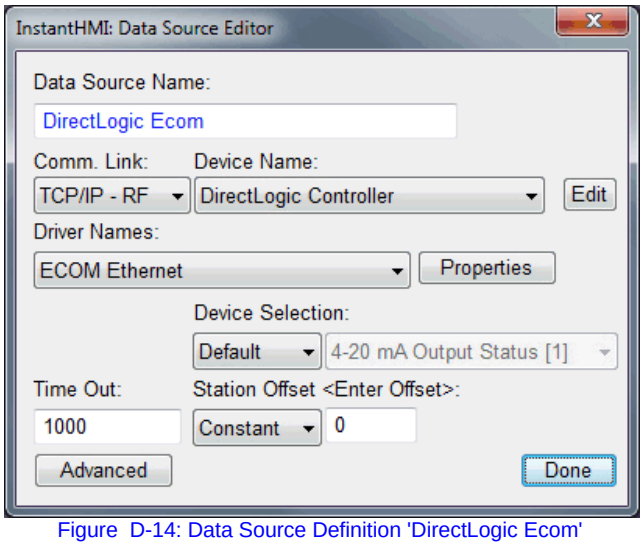

Figure D-14: Data Source Definition 'DirectLogic Ecom'

Here the ' Direct Logic Ecom' data source is defined as shown in Figure D-14. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the following:

- Driver Name: Ecom - Ethernet
- Comm Link: TCP/IP - RF
- Device Name: Direct Logic Controller
- Time Out: 1000 (msec - default)

Associate this data source with each tag (Note: if you use the old name ' Direct Logic Serial' - Section D.3.1 - but only change the definition as shown here, then the old tag definitions can be used without change). For illustration, we have used a new Data Source name ' Direct Logic Ecom' (to emphasize the Ethernet Link) and changed the data source reference in each tag accordingly. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

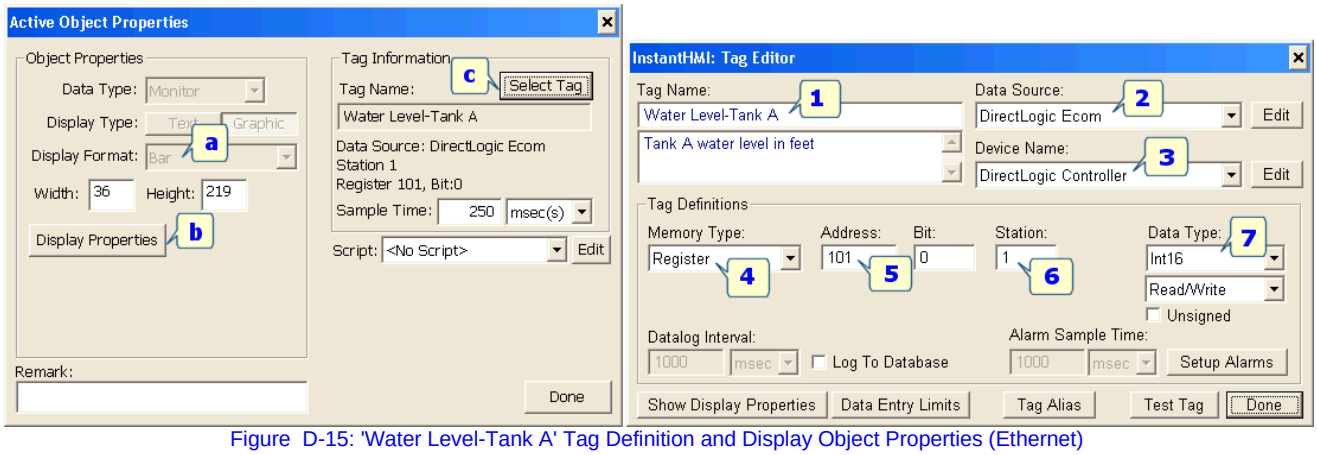

Figure D-15: 'Water Level-Tank A' Tag Definition and Display Object Properties (Ethernet)

Tank Level Tag Definition

1. Tag Name: 'Water Level - Tank A'
2. Data Source: ' DirectLogic Ecom'
3. Memory Type: 'Register'
4. Address: '101',
5. Device Name: ' Direct Logic Controller' (should match PLC/Ecom IP Address etc.)
6. Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

D.3.3 Koyo / DirectLogic Communications (Protocols and Drivers)

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with controllers from various manufacturers. This communication may take place using:

- A serial cable link to a serial comm port on your controller.
- An RF link to an RF access point on the controller.
- A TCP/IP link to a TCP/IP compatible controller.
- An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

Please note that you must have the proper runtime engine installed on the target platform, and you must Register and Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

DirectNet/CCM2 Communication Protocol-Driver 07

The communication link is used to transfer information between the runtime platform and your controller according to the Texas Instrument 305/405 series CCM2 protocol and the Koyo / DirectLogic (DL205, DL305, DL405 series) DirectNet protocol using the Master/Slave mode, and check sum error checking. The functions implemented in the standard release of InstantHMI Driver 07 are listed in are listed in the table below. If you need any additional functions please contact Software Horizons.

Setting up your PLC for Proper Communications

InstantHMI uses a default setting of 9600 baud, no parity, 8 data bits, 1 stop bit. For the Texas Instruments Controller module set the switches as indicated below:

Online/Offline:	ON
Communication Port:	Switch 2 ON, other switches OFF
Slave ID:	Switch 1 ON, other switches OFF

With some Koyo / DirectLogic controllers, the Station Number is configurable via PLC configuration software (factory default is 1). You may choose a lower/higher baud rate, or different Slave ID / Station Number if desired; make sure the InstantHMI Data Source reflects any changes you make. Please see Section D.3.1 of this Manual for more information on how to configure data sources.

If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your data source can be edited by tapping Setup → Comm Setup from the InstantHMI Main Menu on your PDA. See Section 3.1 in the InstantHMI Manual for more information.

Serial Cable Connections

Connect the PLC to the RS-232C port of your runtime platform using a standard RS-232 Cable. Some PDAs or Windows CE devices may require a converter to communicate with the device (contact Software Horizons for further information).

Ecom Communication Protocol-Driver 62

The communication link is used to transfer information between the runtime platform and your controller according to Ecom Ethernet protocol. The functions implemented in the standard release of InstantHMI Driver 62 (Ecom Ethernet) are listed in the table below.

Addressing (Memory Mapping)

Koyo DL205/305/405 series PLC Addresses

InstantHMI implements the Koyo DL205/305/405 series DirectNet protocol using the Master/Slave mode, and check sum error checking. The following functions are implemented in the standard release of InstantHMI driver #07. If you need any additional functions please contact Software Horizons.

Cross Reference for interfacing the Koyo PLC to InstantHMI is included below. The Octal column is the actual V-Memory in the PLC and the Decimal column is the Hostlink Address for use in InstantHMI. Note that there is an Offset of 1, ie, InstantHMI Address = (PLC) Octal to Decimal + 1. (You may use Windows Calculator to do the Octal to Decimal conversion.)

Koyo / DirectLogic PLC			InstantHMI Data Specification		
Memory Type	**Function Code**	**Address (Oct)**	**Memory Type**	**Address (Dec)**	**Remarks**
Vmem	31	V1400 V17777	Register	769 8192	Read or write data registers.
Control Relay	31	V40600 (Bits 0-17)	Bit	16769 (Bits 0-15)	Read or Write bits in a register.
Timer	31	xxx	Timer	xxx	Read or write status of timers.
Counter	31	xxx	Counter	xxx	Read or write status of counters.
Input	32	V40400 (Bits 0-17)	Bit	16641 (Bits 0-15)	Read ON/OFF Status of discrete inputs.
Output	33	V40500 (Bits 0-17)	Bit	16705 (Bits 0-15)	Read ON/OFF Status of discrete outputs.

Texas Instruments PLC Addressing

InstantHMI implements the Texas Instruments CCM2 communications protocol using the Master/Slave mode, and check sum error checking. The following functions are implemented in the standard release of InstantHMI driver #07. If you need any additional functions please contact Software Horizons.

Texas Instruments				InstantHMI Data Specification	
Memory Type	**PLC Function Code**	**PLC Address (Dec)**	**Memory Type**	**InstantHMI Address (Dec)**	**Remarks**
Vmem	31	xxx	Register	xxx	Read or write data registers.
Control Relay	31	xxx	Bit	xxx	Read or write bits in a register.
Timer	31	xxx	Timer	xxx	Read or write status of timers.
Counter	31	xxx	Counter	xxx	Read or write status of counters.
Input	32	xxx	Bit	xxx	Read ON/OFF Status of discrete inputs.
Output	33	xxx	Bit	xxx	Read ON/OFF Status of discrete outputs.

Addressing Examples

DL405 PLC address 1400 Octal will be 769 decimal in InstantHMI. Similarly, 3717 Octal in DL405 will be 2000 decimal in InstantHMI.

D.4 Solution for Unitronics PLC

For training purposes, to explain the design of screens and screen objects independent of the PLC, initially we avoided the use of the PLC and used a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the PLC). This Simulation Approach did not require us to define a Data Source for the Local Memory in the PC Simulation of the PLC; nor did we need to worry about the Communication Link between the Runtime Platform and the PLC. However, to use data registers and I/O from Unitronics PLC (connected by Serial or Ethernet link to PC InstantHMI Runtime Engine) you must define a Data Source for your PLC.

This Appendix may be used for any Unitronics controllers. Please refer to Memory Map for Unitronics PLC are listed in the table below if you wish to implement the Water Supply System control logic in your PLC and define PLC tags.

InstantHMI uses three different communication protocols to communicate with the Unitronics PLCs. Section D.4.1 covers the serial ASCII PCOM protocol and the serial Modbus RTU protocol. Section D.4.2 covers the Modbus TCP - Ethernet protocol.

D.4.1 Unitronics Serial Protocol

The serial ASCII PCOM protocol is covered in detail here. For use of Modbus RTU protocol see Section D.4.3 and Appendix D.2.

Communication Link

Connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) using a serial cable to your PLC. If wireless link is desired, suitable adapter kits for your PLC (Serial-Infrared, Serial-WiFi, Serial-Bluetooth) are available from Software Horizons.

Data Source

Define the Data Source 'Unitronics Serial' as shown in Figure D-16. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name: Unitronics - ASCII PCOM
- Comm Link: Direct Serial
- Port: Com1
- Baud Rate: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Time Out: 1000 (msec - default)
- Station Offset: 0

We have chosen Station Offset: 0 to match the PLC in our setup. Other driver options may be chosen to suit your own controller.

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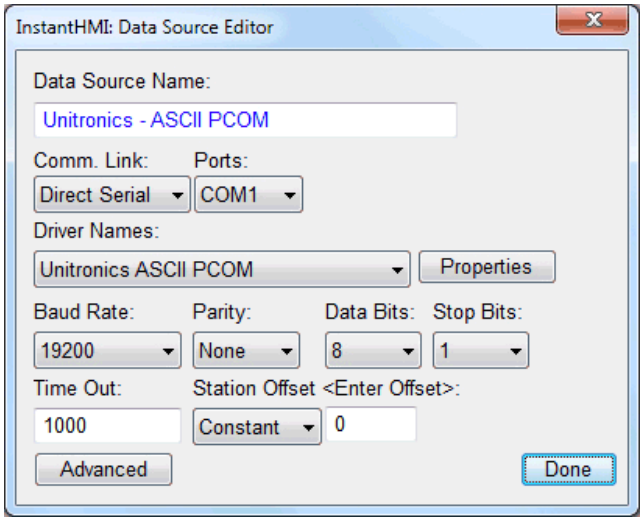

Figure D-16: Data Source Definition 'Unitronics - ASCII PCOM'

At this point, the Runtime script still controls the simulation and the old tag definitions can be used without change. You may implement your own logic in the PLC and remove the runtime script from the project for your PLC logic to drive the Water Supply System behavior. To switch to PLC tags, you will need to associate the data source we just defined with each tag in the Tag Database (except Date and Time, which remain Local Memory tags). This automatically associates the screen objects with PLC tags as opposed to the Local memory tags previously used in the simulation. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

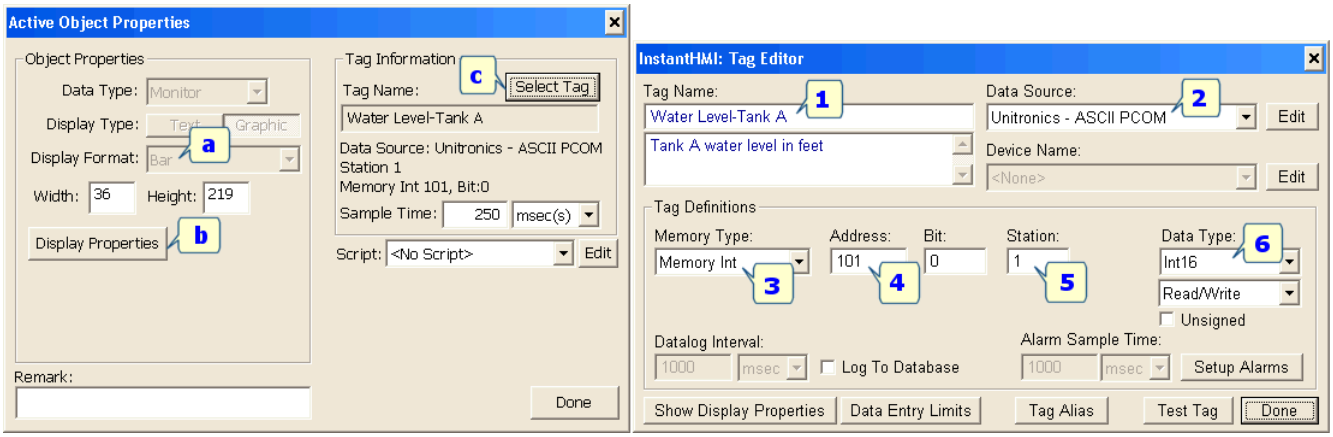

Figure D-17: 'Water Level-Tank A' Tag Definition and Display Object Properties (Serial)

Tank Level Tag Definition

1 Tag Name: 'Water Level -Tank A'
2 Data Source: 'Unitronics - ASCII PCOM'
3 Memory Type: 'Memory Int' (Use Register with Modbus RTU protocol)
4 Address: 101 (see Modbus mapping in Section D.4.3 are listed in the table below)
5 Station: '1' (should match your PLC)
6 Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

The table of Local Memory tags (variables of interest) used in the simulation is repeated below. Note that we have included a column labeled 'PLC Address' next to the Local Memory Address column. PLC Address column defines the register memory tags in the PLC. This re-defines all the tags to suit your PLC (Example: DirectLogic).

Tag Name	Data Type	Data Format	Local Memory Address (Dec)	PLC Address		Tag Group Membership
				PCOM Memory Int (Dec)	Modbus Register (Dec)	
Alarm State - Tank A	Monitor	Integer	102	102	102	Tank A
Alarm State - Tank B	Monitor	Integer	152	152	152	Well
Booster Pump Rate	Monitor	Integer	164	164	164	System
Limit Switch	Monitor	Integer	161	161	161	System
Lower Limit	Monitor	Integer	166	166	166	System
Pump Status	Monitor	Integer	168	168	168	System
Pump Status-Scaled	Monitor	Integer	168	168	168	System
System Alarm	Monitor	Integer	167	167	167	System
System Date	Monitor	Date	1			
System Time	Monitor	Time	4			
Upper Limit	Monitor	Integer	165	165	165	System
Water In Rate	Monitor	Integer	162	162	162	System
Water Level - Tank A	Monitor	Integer	101	101	101	Tank A
Water Level - Tank B	Monitor	Integer	151	151	151	Well
Water Out Rate - Tank A	Monitor	Integer	163	163	163	System
Water Out Rate - Tank B	Monitor	Integer	169	169	169	System
Well Run Mode	Monitor	Integer	181	181	181	System, Tank A, Well
Well Status	Monitor	Integer	182	182	182	System, Tank A, Well
Well Status-Scaled	Monitor	Integer	170	170	170	System, Tank A, Well

D.4.2 Unitronics Ethernet Protocol

The discussion in Section D.1 (Unitronics - ASCII PCOM Serial Protocol) applies here as well. Unitronics uses the Modbus TCP protocol over Ethernet (See Section D.2.2). The only changes are as follows:

Communication Link

You connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) over Ethernet link using the Ethernet module at the PLC end instead of using serial cable. If wireless link is desired, suitable adapter kits (Ethernet-Infrared, Ethernet-WiFi) are available from Software Horizons.

Data Source

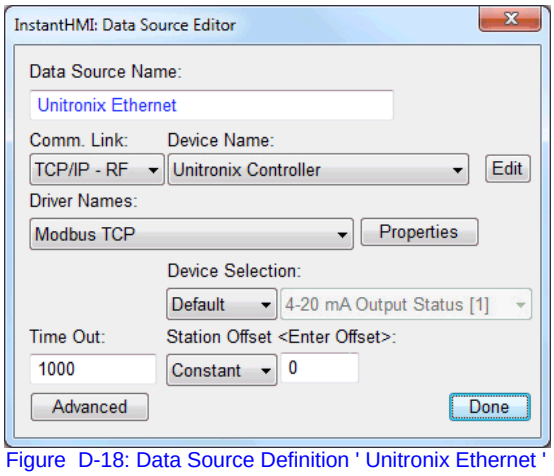

Figure D-18: Data Source Definition ' Unitronix Ethernet '

Here the ' Unitronix Ethernet' data source is defined as shown in Figure D-3. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the following:

- Driver Name: Unitronix Ethernet
- Comm Link: TCP/IP - RF
- Device Name: Unitronix Controller
- Time Out: 1000 (msec - default)

Associate this data source with each tag (Note: if you use the old name ' Unitronics - PCOM ASCII' - Section D.4.1 - but only change the definition as shown here, then the old tag definitions can be used without change). For illustration, we have used a new Data Source name ' Unitronix Ethernet ' (to emphasize the Ethernet Link) and changed the data source reference in each tag accordingly. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

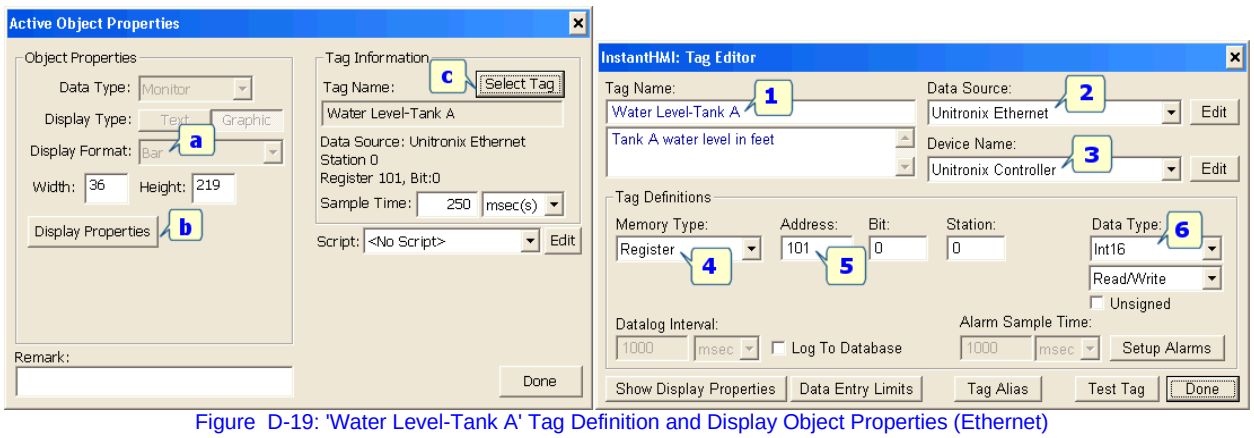

Figure D-19: 'Water Level-Tank A' Tag Definition and Display Object Properties (Ethernet)

Tank Level Tag Definition

1. Tag Name: 'Water Level - Tank A'
2. Data Source: ' Unitronix Ethernet '
3. Memory Type: 'Register'
4. Address: '101',
5. Device Name: ' Unitronix Controller' (should match PLC/Ecom IP Address etc.)
6. Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

D.4.3 Unitronics (Protocols and Drivers)

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with controllers from various manufacturers. This communication may take place using:

- A serial cable link to a serial comm port on your controller.
- An RF link to an RF access point on the controller.
- A TCP/IP link to a TCP/IP compatible controller.
- An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

> Please note that you must have the proper runtime engine installed on the target platform, and you must Register and Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

Unitronics Serial Communication Protocol-Driver 54

The communication link is used to transfer information between the runtime platform and your controller according to the Unitronics PCOM ASCII protocol. The functions implemented in the standard release of InstantHMI Driver 54 are listed in are listed in the table below. If you need any additional functions please contact Software Horizons.

Note: Unitronix also supports Modbus RTU protocol (See Section D.2.1).

Setting up your PLC for Proper Communications

InstantHMI uses a default setting of 9600 baud, no parity, 8 data bits, 1 stop bit. The Station Number is configurable via PLC configuration software (factory default is 1). You may choose a lower/higher baud rate, or different Station Number if desired; make sure the InstantHMI Data Source reflects any changes you make. Please see Section D.4.1 of this Manual for more information on how to configure data sources.

If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your data source can be edited by tapping Setup → Comm Setup from the InstantHMI Main Menu on your PDA. See Section 3.1 in the InstantHMI Manual for more information.

Serial Cable Connections

Connect the PLC to the RS-232C port of your runtime platform using a standard RS-232 Cable. Some PDAs or Windows CE devices may require a converter to communicate with the device (contact Software Horizons for further information).

Unitronix Ethernet Communication Protocol-Driver 53

The communication link is used to transfer information between the runtime platform and your controller according to Modbus TCP protocol. The functions implemented in the standard release of InstantHMI Driver 53 (Modbus TCP) are listed in Section D.2.3.

Addressing (Memory Mapping)

InstantHMI implements the Unitronics PCOM ASCII communications protocol. The following functions are implemented in the standard release of InstantHMI driver #54. If you need any additional functions please contact Software Horizons.

Unitronix uses the Modbus protocol (Modbus RTU for serial communications and Modbus TCP for Ethernet communications). You should refer to the Unitronix manuals for the modbus address mapping corresponding to the various Unitronix Memory Types. For your convenience, we have indicated these mappings in the tables below.

Unitronics			InstantHMI Data Specification		
Memory Type	**Address**	**Command Codes**	**Memory Type**	**Data Type**	**Address**
Memory Integer	xxx	RW / SW	Memory Int	Int16	xxx
Memory Bit	xxx	RB / SB	Memory Bit	Bit	xxx
Memory Long	xxx	RNL / SNL	Memory Long	Int32	xxx
Memory Dword	xxx	RND / SND	Memory DWord	Int32	xxx
Memory Float	xxx	RNF / SNF	Memory Float	Int32	xxx
Input **	xxx	RE	Input	Bit	xxx
Output	xxx	RA / SA	Output	Bit	xxx
System Integer	xxx	GF / SF	System Int	Int16	xxx
System Bit	xxx	GS / SS	System Bit	Bit	xxx
System Long	xxx	RNH / SNH	System Long	Int32	xxx
System Dword	xxx	RNJ / SNJ	System DWord	Int32	xxx
Timer – Preset **	xxx	GP	Timer – Preset	Int32	xxx
Timer – Current **	xxx	GT	Timer – Current	Int32	xxx
Timer – Scan Bit **	xxx	RT	Timer – Scan Bit	Bit	xxx
Counter – Preset **	xxx	GY	Counter – Preset	Int16	xxx
Counter – Current **	xxx	GX	Counter – Current	Int16	xxx
Counter – Scan Bit **	xxx	RM	Counter – Scan Bit	Bit	xxx

**** These Memory Types are READ ONLY**

Addressing Examples

These Addresses may or may not be valid for your PLC, check your PLC documentation to ensure that you are using addresses that are supported by your specific PLC.

Unitronics		InstantHMI Data Specification					
Memory Type	**Address Dec**	**Memory Type**	**Data Type**	**Address (PCOM Ascii)**	**Bit #**	**Address-Dec Modbus (Monochrome)**	**Address-Dec Modbus (Color)**
Memory Integer	25	Memory Int	Int16	25	0	25	25
Memory Bit	50	Memory Bit	Bit	50	0	50	50
Memory Long	3	Memory Long	Int32	3	0	5103	28675
Memory Dword	6	Memory DWord	Int32	6	0	6306	32684
Memory Float	1	Memory Float	Int32	1	0	7701	16385
Input **	5	Input	Bit	5	0	4005	24581
Output	7	Output	Bit	7	0	5007	16391
System Integer	200	System Int	Int16	200	0	4200	37064
System Bit	150	System Bit	Bit	150	0	3150	20630
System Long	40	System Long	Int32	40	0	6140	41000
System DWord	55	System DWord	Int32	55	0	6755	45111
Timer – Preset **	20	Timer – Preset	Int32	20	0	6920	49172
Timer – Current **	20	Timer – Current	Int32	20	0	7320	53268
Timer – Scan Bit **	20	Timer – Scan Bit	Bit	20	0	6020	28692
Counter – Preset **	10	Counter – Preset	Int16	10	0	7810	57354
Counter – Current **	10	Counter – Current	Int16	10	0	7910	61450
Counter – Scan Bit **	10	Counter – Scan Bit	Bit	10	0	7010	32688

**** These Memory Types are READ ONLY**

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D.5 Solution for Siemens PLC

For training purposes, to explain the design of screens and screen objects independent of the PLC, initially we avoided the use of the PLC and used a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the PLC). This Simulation Approach did not require us to define a Data Source for the Local Memory in the PC Simulation of the PLC; nor did we need to worry about the Communication Link between the Runtime Platform and the PLC. However, to use data registers and I/O from Siemens PLC (connected by Serial or Ethernet link to PC InstantHMI Runtime Engine) you must define a Data Source for your PLC.

This Appendix may be used for Siemens controllers. Please refer to Memory Map for Siemens PLC (Section D.5.2) if you wish to implement the Water Supply System control logic in your PLC and define PLC tags.

InstantHMI uses two different communication protocols to communicate with the Siemens PLCs. Section D.5.1 covers the serial PPI protocol. Section D.5.2 covers the Siemens MPI protocol.

Note: Texas Instruments PLC is also covered under the banner Siemens PLC. InstantHMI uses a third communication protocol (Driver 01) to communicate with the TI PLCs. Section D.5.3 covers the TI serial protocol.

D.5.1 Siemens - PPI Protocol

Communication Link

Connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) using a serial cable to your PLC. If wireless link is desired, suitable adapter kits for your PLC (Serial-Infrared, Serial-WiFi, Serial-Bluetooth) are available from Software Horizons.

Data Source

Define the Data Source 'Siemens PPI' as shown in Figure D-20 (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name : Siemens PPI
- Comm Link : Direct Serial
- Port : Com1
- Baud Rate : 19200
- Parity : odd
- Data Bits : 8
- Stop Bits : 1
- Time Out : 1000 (msec - default)
- Station Offset : 2

We have chosen Station Offset: 2 to match the PLC in our setup. Other driver options may be chosen to suit your own controller.

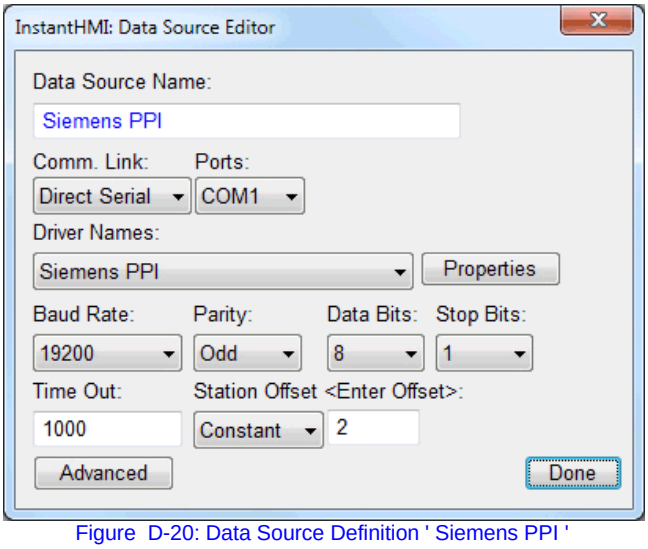


Figure D-20: Data Source Definition ' Siemens PPI '

At this point, the Runtime script still controls the simulation and the old tag definitions can be used without change. You may implement your own logic in the PLC and remove the runtime script from the project for your PLC logic to drive the Water Supply System behavior. To switch to PLC tags, you will need to associate the data source we just defined with each tag in the Tag Database (except Date and Time, which remain Local Memory tags). This automatically associates the screen objects with PLC tags as opposed to the Local memory tags previously used in the simulation. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

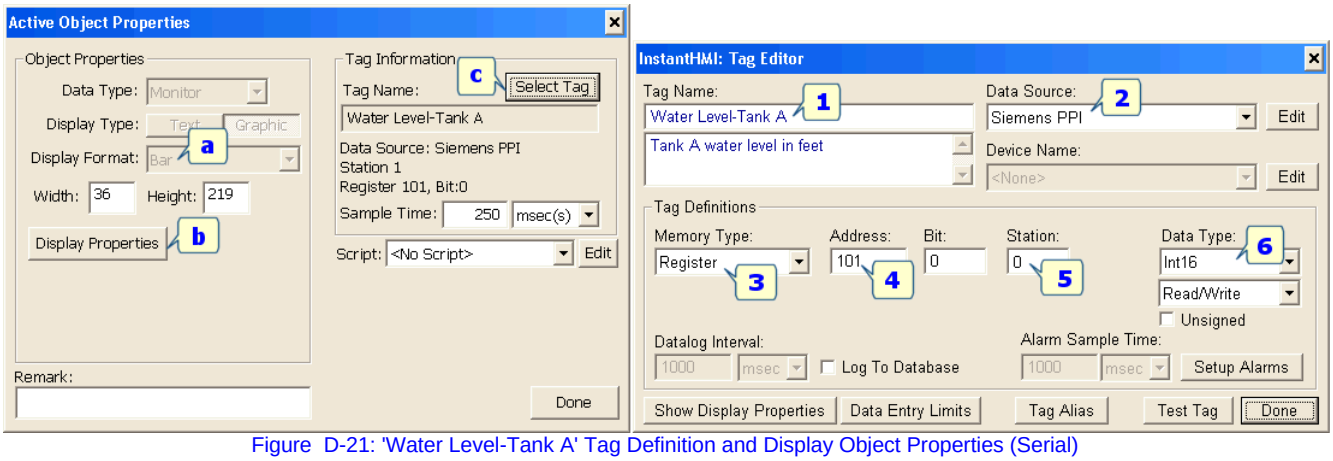


Figure D-21: 'Water Level-Tank A' Tag Definition and Display Object Properties (Serial)

Tank Level Tag Definition

1 Tag Name : 'Water Level -Tank A'
2 Data Source : Siemens PPI'
3 Memory Type: 'Register'
4 Address : 202
5 Station : '0' (should match your PLC)
6 Data Type : Int16 (default)

The VBar definition for Tank A level is complete.
The table of Local Memory tags (variables of interest) used in the simulation is repeated below. Note that we have included a column labeled 'PLC Address' next to the Local Memory Address

column. PLC Address column defines the register memory tags in the PLC. This re-defines all the tags to suit your PLC (Example: DirectLogic).

Tag Name	Data Type	Data Format	Local Memory Address (Dec)	PLC Address Register (Oct)	Tag Group Membership
Alarm State - Tank A	Monitor	Integer	102	1441	Tank A
Alarm State - Tank B	Monitor	Integer	152	1667	Well
Booster Pump Rate	Monitor	Integer	164	1703	System
Limit Switch	Monitor	Integer	161	1700	System
Lower Limit	Monitor	Integer	166	1705	System
Pump Status	Monitor	Integer	168	1707	System
Pump Status-Scaled	Monitor	Integer	168	1712	System
System Alarm	Monitor	Integer	167	1706	System
System Date	Monitor	Date	1		
System Time	Monitor	Time	4		
Upper Limit	Monitor	Integer	165	1704	System
Water In Rate	Monitor	Integer	162	1701	System
Water Level - Tank A	Monitor	Integer	101	1440	Tank A
Water Level - Tank B	Monitor	Integer	151	1666	Well
Water Out Rate - Tank A	Monitor	Integer	163	1702	System
Water Out Rate - Tank B	Monitor	Integer	169	1710	System
Well Run Mode	Monitor	Integer	181	1724	System, Tank A, Well
Well Status	Monitor	Integer	182	1725	System, Tank A, Well
Well Status-Scaled	Monitor	Integer	170	1711	System, Tank A, Well

D.5.2 Siemens - MPI Protocol

The discussions in Section D.5.1 (Siemens PPI Serial Protocol) applies here as well. The only changes are as follows:

Communication Link

You connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) over Ethernet link using the Ecom module at the PLC end instead of using serial cable. If wireless link is desired, suitable adapter kits (Ethernet-Infrared, Ethernet-WiFi) are available from Software Horizons.

Data Source

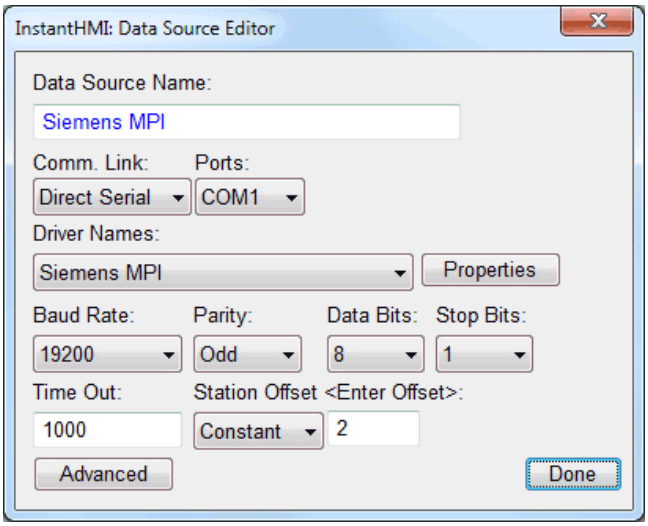


Figure D-22: Data Source Definition 'Siemens MPI'

Here the 'Siemens MPI' data source is defined as shown in Figure D-22. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the following:

- Driver Name : Siemens MPI
- Comm Link : Direct Serial
- Port : Com1
- Baud Rate : 19200
- Parity : odd

- Data Bits : 8
- Stop Bits : 1
- Time Out : 1000 (msec - default)
- Station Offset : 2

Associate this data source with each tag (Note: if you use the old name ' Siemens PPI ' - but only change the definition as shown here, then the old tag definitions can be used without change). For illustration, we have used a new Data Source name ' Siemens MPI' and changed the data source reference in each tag accordingly. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (VBar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

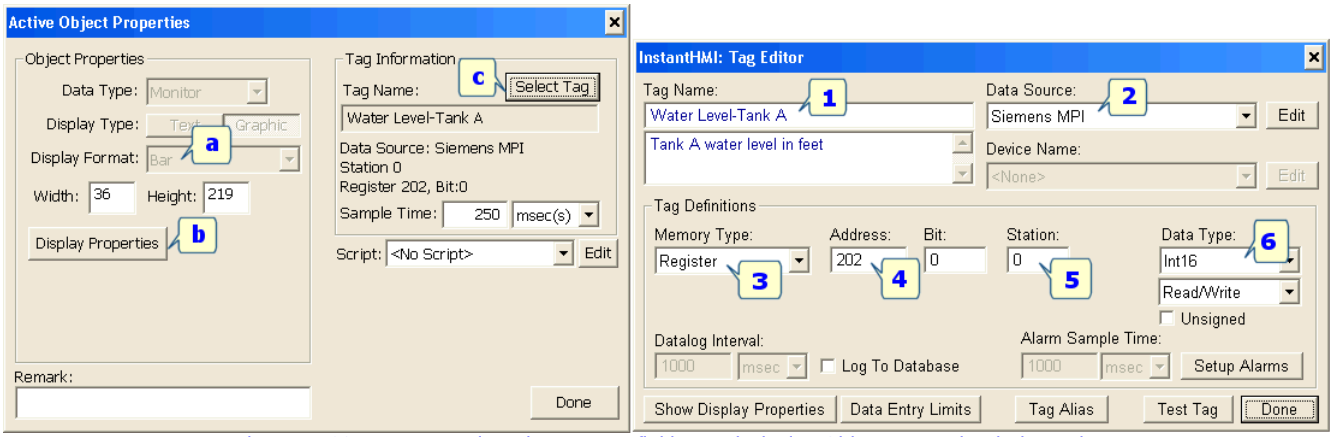


Figure D-23: 'Water Level-Tank A' Tag Definition and Display Object Properties (Ethernet)

Tank Level Tag Definition

1 Tag Name : 'Water Level -Tank A'
2 Data Source : Siemens PPI'
3 Memory Type: 'Register'
4 Address : 202
5 Station : '0' (should match your PLC)
6 Data Type : Int16 (default)

The Bar definition for Tank A level is complete.

D.5.3 Texas Instruments PLC

Communication Link

Connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) using a serial cable to your PLC. If wireless link is desired, suitable adapter kits for your PLC (Serial-Infrared, Serial-WiFi, Serial-Bluetooth) are available from Software Horizons.

Data Source

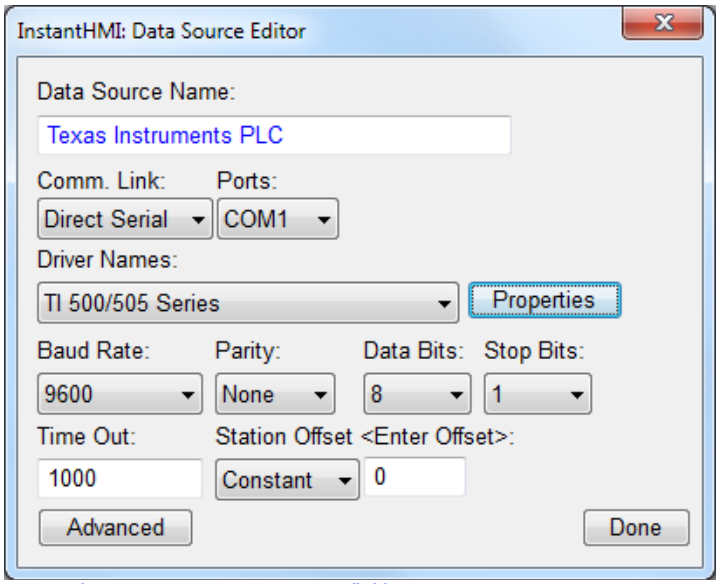


Figure D-24: Data Source Definition 'Texas Instruments PLC'

Here the 'Texas Instruments PLC' data source is defined as shown in Figure D-24. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the following:

- Driver Name : TI 500/505 Series
- Comm Link : Direct Serial
- Port : Com1
- Baud Rate : 9600
- Parity : None
- Data Bits : 8
- Stop Bits : 1
- Time Out : 1000 (msec - default)
- Station Offset : 0

Associate this data source with each tag (Note: if you use the old name ' Siemens PPI ' - but only change the definition as shown here, then the old tag definitions can be used without change). For illustration, we have used a new Data Source name 'Texas Instruments PLC' and changed the data source reference in each tag accordingly. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (VBar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

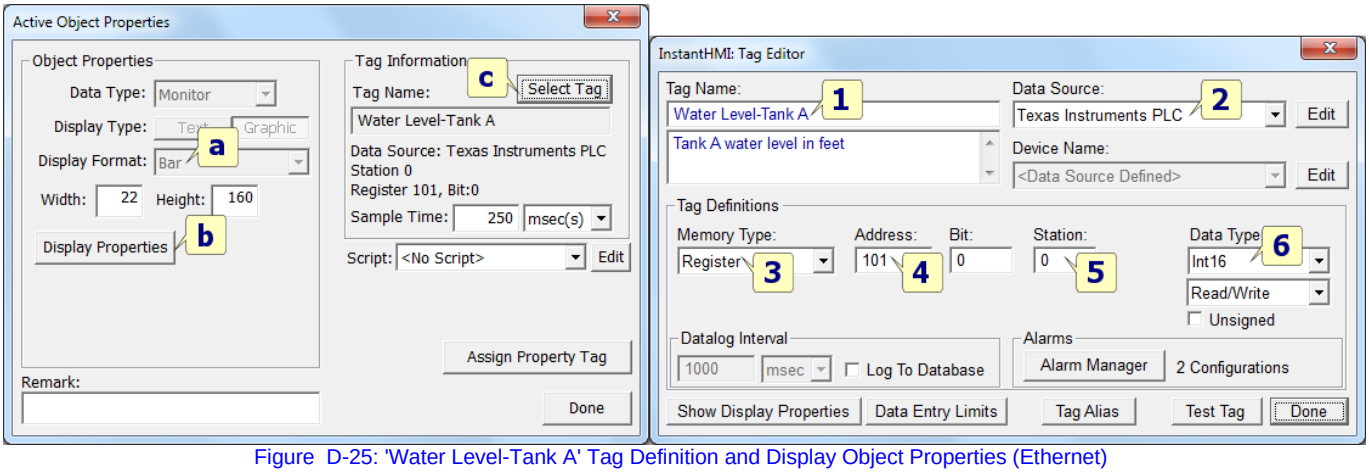


Figure D-25: 'Water Level-Tank A' Tag Definition and Display Object Properties (Ethernet)

Tank Level Tag Definition

1	Tag Name	: 'Water Level -Tank A'
2	Data Source	: 'Texas Instruments PLC'
3	Memory Type	: 'Register'
4	Address	: 101
5	Station	: '0' (should match your PLC)
6	Data Type	: Int16 (default)

The Bar definition for Tank A level is complete.

D.5.4 Siemens Communications (Protocols and Drivers)

Introduction

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with controllers from various manufacturers. This communication may take place using:

- A serial cable link to a serial comm port on your controller.
- An RF link to an RF access point on the controller.
- A TCP/IP link to a TCP/IP compatible controller.
- An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

PPI Communication Protocol – Driver 44

The communication link is used to transfer information between the runtime platform and your controller according to the Siemens Point to Point Interface (PPI) protocol. Please note that you must have the proper runtime engine installed on the target platform, and you must Register / Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

Setting up your PLC for Proper Communications

Siemens S7 Series Programmable Controllers (Model 200, 300 etc.), carefully follow the installation instructions in the appropriate Siemens Manual. InstantHMI uses Siemens PPI protocol with a default communication setting of 9600 baud, Even Parity, 8 data bits,1 stop bit.

Switch 1: OFF Switch 2: ON Switch 3: OFF Switch 4: OFF Switch 5: OFF	For example ensure the Isolated PC/PPI Cable connected to the S7-200 Controller is configured properly. Set the switches as indicated on the left to select 9600 baud, 11 bit and DCE.

For example ensure the Isolated PC/PPI Cable connected to the S7-200 Controller is configured properly. Set the switches as indicated on the left to select 9600 baud, 11 bit and DCE.

With some Siemens controllers, the Station Number/PLC Address is configurable via PLC configuration software (factory default is 1).

You may choose a lower/higher baud rate, or different Station Number/PLC Address if desired; make sure the InstantHMI Data Source reflects any changes you make. See Section 3.1 of the InstantHMI Manual for details on how to configure Data Sources.

If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your Data Source can be edited by tapping Setup → Comm Setup from the InstantHMI Main Menu on your PDA. See Section 9-3 in the InstantHMI Manual for more information.

Communication Protocol

The following functions are implemented in the standard release of InstantHMI Siemens PPI driver. If you need any additional functionality please contact Software Horizons.

Siemens S7-Series			**InstantHMI Data Specification**	
Memory Type	**PLC Address (Dec)**	**Memory Type**	**InstantHMI Address**	**Remarks**
VW	xxxx	Register	Xxxx	Read or write registers
M	xxxx	Bit	Xxxx	Read or write bits
T	xxxx	Timer – Current	Xxxx	Read current timer
C	xxxx	Counter - Current	Xxxx	Read current counter
I	xxxx	Digital Input	Xxxx	Read input
Q	xxxx	Digital Output	Xxxx	Read or write output

Examples

Siemens S7-Series			**InstantHMI Data Specification**		
Memory Type	**PLC Address**	**Memory Type**	**InstantHMI Address**	**InstantHMI Bit #**	**Remarks**
VW	VW204	Register	204	0	Read or write registers
M	M0.2	Bit	0	2	Read or write bits
T	T37	Timer - Current	37	0	Read current timer
C	C5	Counter - Current	5	0	Read current counter
I	I1.2	Digital Input	1	2	Read input
Q	Q0.3	Digital Output	0	3	Read or write output

MPI Communication Protocol – Driver 83

Introduction

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with controllers from various manufacturers. This communication may take place using:

- A serial cable link to a serial comm port on your controller.
- An RF link to an RF access point on the controller.

- A TCP/IP link to a TCP/IP compatible controller.
- An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

Communication Link

The communication link is used to transfer information between the runtime platform and your controller according to the Siemens Multi Point Interface (MPI) protocol. Please note that you must have the proper runtime engine installed on the target platform, and you must Register / Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

Setting up your PLC for Proper Communications

Siemens S7 Series Programmable Controllers (Model 200, 300, 400 etc.), carefully follow the installation instructions in the appropriate Siemens Manual. InstantHMI uses Siemens MPI protocol with a default communication setting of 9600 baud, Even Parity, 8 data bits,1 stop bit.

Switch 1: OFF Switch 2: ON Switch 3: OFF Switch 4: OFF Switch 5: OFF	For example ensure the Isolated PC/MPI Cable connected to the S7-200 Controller is configured properly. Set the switches as indicated on the left to select 9600 baud, 11 bit and DCE.

For example ensure the Isolated PC/MPI Cable connected to the S7-200 Controller is configured properly. Set the switches as indicated on the left to select 9600 baud, 11 bit and DCE.
With some Siemens controllers, the Station Number/PLC Address is configurable via PLC configuration software (factory default is 1).
You may choose a lower/higher baud rate, or different Station Number/PLC Address if desired; make sure the InstantHMI Data Source reflects any changes you make. See Section 3.1 of the InstantHMI Manual for details on how to configure Data Sources.
If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your Data Source can be edited by tapping Setup → Comm Setup from the InstantHMI Main Menu on your PDA. See Section 9.2.1 in the InstantHMI Manual for more information.

Communication Protocol

The following functions are implemented in the standard release of InstantHMI Siemens MPI driver. If you need any additional functionality please contact Software Horizons.

Siemens S7-Series			**InstantHMI Data Specification**	
Memory Type	**PLC Address (Dec)**	**Memory Type**	**InstantHMI Address**	**Remarks**
VW	xxxx	Register	Xxxx	Read or write registers
M	xxxx	Bit	Xxxx	Read or write bits
T	xxxx	Timer – Current	Xxxx	Read current timer
C	xxxx	Counter - Current	Xxxx	Read current counter
I	xxxx	Digital Input	Xxxx	Read input
Q	xxxx	Digital Output	Xxxx	Read or write output
PIW	xxxx	Peripheral Input	Xxxx	Read Peripheral Input
PQW	xxxx	Peripheral Output	Xxxx	Write Peripheral Output

Examples

Siemens S7-Series			InstantHMI Data Specification		
Memory Type	**PLC Address**	**Memory Type**	**InstantHMI Address**	**InstantHMI Bit #**	**Remarks**
VW	VW204	Register	204	0	Read or write registers
M	M0.2	Bit	0	2	Read or write bits
T	T37	Timer - Current	37	0	Read current timer
C	C5	Counter - Current	5	0	Read current counter
I	I1.2	Digital Input	1	2	Read input
Q	Q0.3	Digital Output	0	3	Read or write output
PIW	PIW752	Peripheral Input	752	0	Read Peripheral Input
PQW	PQW754	Peripheral Output	754	0	Write Peripheral Output

D.5.5 TI Communication Protocol – Driver 01

If you are using Texas Instruments Series 500 Programmable Controllers Model 520C, 530C, 545, 550, 560, 565 etc., carefully follow the installation instructions in the appropriate Texas Instruments Manual.

RS232 Port Switch Settings

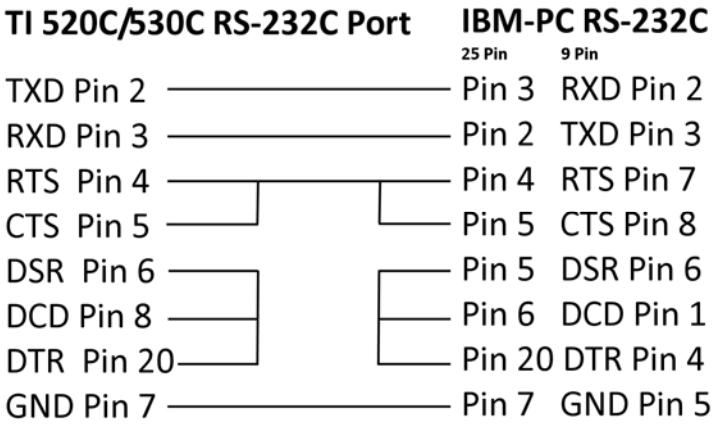
For the 520C/530C Controller module set the switches as indicated below to select 9600 baud:

Switch 3 : ON
Switch 4 : ON

You may choose a lower/higher baud rate if desired. For other Controller modules select Baud rate accordingly.

Cable Connections

Connect the RS232 port (Programming port) on your 520C/530C Controller module directly to your IBM-PC using the standard Texas Instruments Cable or the following cable connection:



Communication Protocol

InstantHMI implements the Texas Instrument series 500 Data Link protocol using ECC error checking. The following functions are implemented in the standard release of InstantHMI 01 driver. If you need any additional functions please contact Software Horizons.

Addressing

TI Series PLC		InstantHMI Data Specification			
Memory Type	**PLC Address (Dec)**	**Memory Type**	**InstantHMI Address**	**PLC Function (Hex)**	**Remarks**
V	xxxx	Register	xxxx	01 02	Read or write registers
C	xxxx	Bit	xxxx	12 14	Read or write bits
Timer	xxxx	Timer – Current	xxxx	0C 0D 0E	Read current timer
Counter	xxxx	Counter - Current	xxxx	0C 0D 0E	Read current counter
X	xxxx	Digital Input	xxxx	12	Read ON/OFF status of discrete inputs
Y	xxxx	Digital Output	xxxx	12 14	Read ON/OFF status of discrete outputs

Examples

TI Series PLC		InstantHMI Data Specification			
Memory Type	**PLC Address**	**Memory Type**	**InstantHMI Address**	**InstantHMI Bit #**	**Remarks**
V	V95	Register	95	0	Read or write registers
C	C100	Bit	100	0	Read or write bits
Timer	Timer 7	Timer - Preset	7	0	Read Preset Timer
Timer	Timer 8	Timer - Current	8	0	Read Current Timer
Counter	Counter 9	Counter - Preset	9	0	Read Preset Counter
Counter	Counter 10	Counter - Current	10	0	Read Current Counter
X	X101	Digital Input	101	0	Read Input
Y	Y202	Digital Output	202	0	Read or Write Output

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D.6 Solution for Mitsubishi Controllers

For training purposes, to explain the design of screens and screen objects independent of the PLC, initially we avoided the use of the PLC and used a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the PLC). This Simulation Approach did not require us to define a Data Source for the Local Memory in the PC Simulation of the PLC; nor did we need to worry about the Communication Link between the Runtime Platform and the PLC. However, to use data registers and I/O from Mitsubishi PLC (connected by Serial or Ethernet link to PC InstantHMI Runtime Engine) you must define a Data Source for your PLC.

This Appendix may be used for any Mitsubishi controllers. Please refer to Memory Map for Mitsubishi PLC (Section D.6.2) if you wish to implement the Water Supply System control logic in your PLC and define PLC tags.

D.6.1 Mitsubishi Serial Protocol

Communication Link

Connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) using a serial cable to your PLC. If wireless link is desired, suitable adapter kits for your PLC (Serial-Infrared, Serial-WiFi, Serial-Bluetooth) are available from Software Horizons.

Data Source

Define the Data Source 'Mitsubishi' as shown in Figure D-26. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name: Mitsubishi
- Comm Link: Direct Serial
- Port: Com1
- Baud Rate: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Time Out: 1000 (msec - default)
- Station Offset: 0

We have chosen Station Offset: 0 to match the PLC in our setup. Other driver options may be chosen to suit your own controller.

The Mitsubishi driver supports the dedicated computer link protocols 1 to 4 with and without sum check and supports the programming port protocol for FX and FX2N controllers. Click the 'Properties' button to select the appropriate protocol settings for your controller. If your controller is connected through a computer link port select the protocol 'Computer Link' and select the format and sum check settings to match your controller as shown below.

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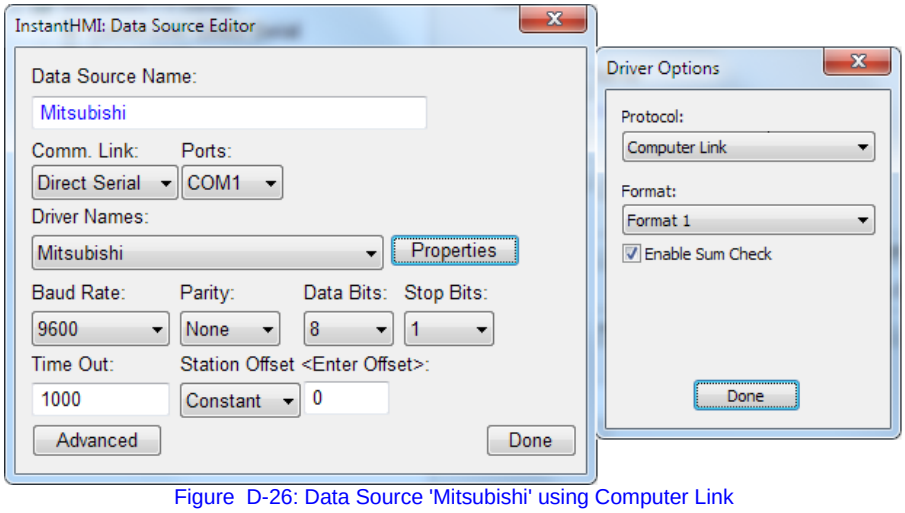


Figure D-26: Data Source 'Mitsubishi' using Computer Link

If your controller is a FX or FX2N series and is connected through the programming port select the protocol 'FX Programming Port' and select the PLC type FX or FX2N to match your controller as shown below. Typically communication settings for FX and FX2N controllers are 9600 baud, even parity, 7 data bits, and 1 stop bit.

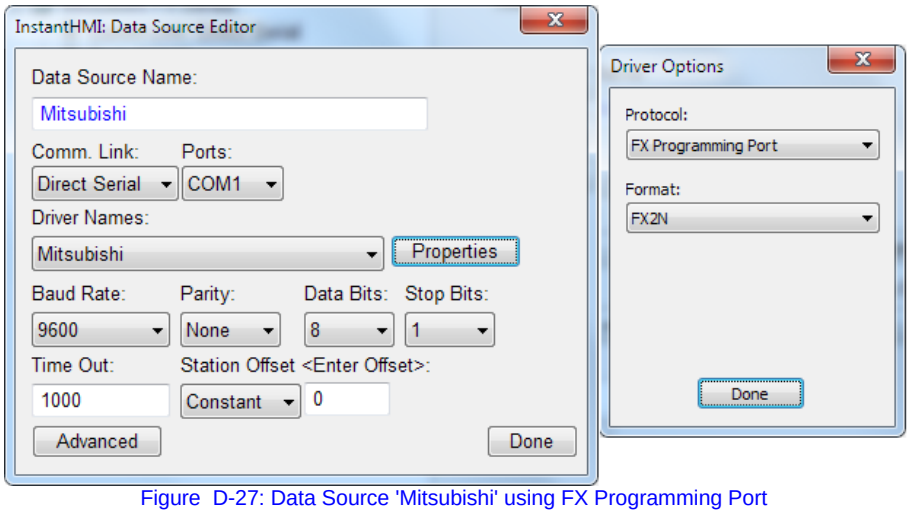


Figure D-27: Data Source 'Mitsubishi' using FX Programming Port

At this point, the Runtime script still controls the simulation and the old tag definitions can be used without change. You may implement your own logic in the PLC and remove the runtime script from the project for your PLC logic to drive the Water Supply System behavior. To switch to PLC tags, you will need to associate the data source we just defined with each tag in the Tag Database (except Date and Time, which remain Local Memory tags). This automatically associates the screen objects with PLC tags as opposed to the Local memory tags previously used in the simulation. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0' Fill Color and Background Color as desired
c) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

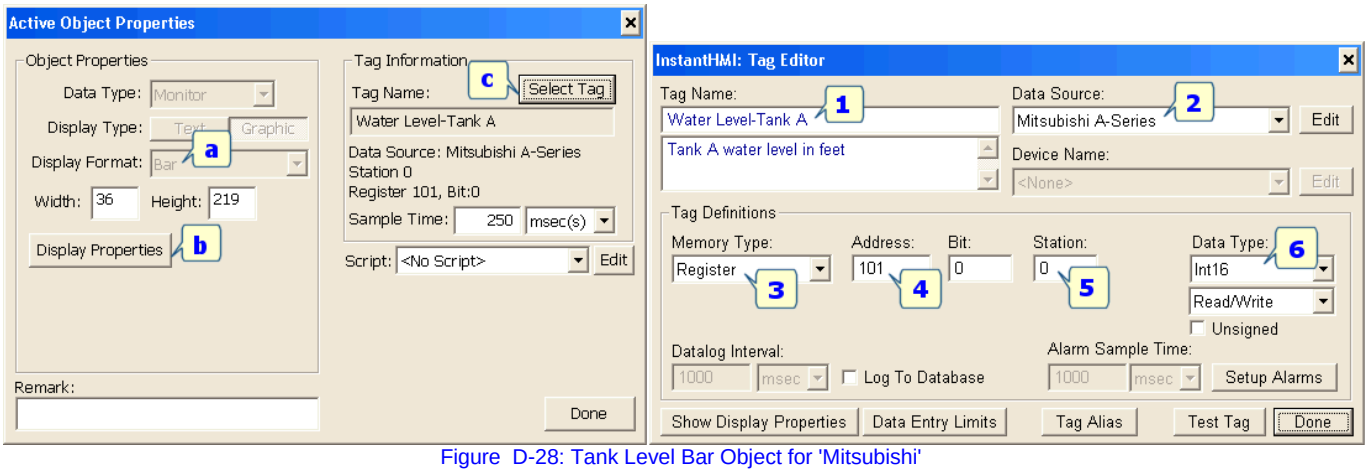


Figure D-28: Tank Level Bar Object for 'Mitsubishi'

Tank Level Tag Definition

1 Tag Name: 'Water Level -Tank A'
2 Data Source: 'Mitsubishi'
3 Memory Type: 'Register'
4 Address: 101
5 Station: '0' (should match your PLC)
6 Data Type: Int16 (default)

The VBar definition for Tank A level is complete. The table of Local Memory tags (variables of interest) used in the simulation is repeated below. Note that we have included a column labeled 'PLC Address' next to the Local Memory Address column. PLC Address column defines the register memory tags in the PLC. This re-defines all the tags to suit your PLC (Example: Mitsubishi).

Tag Name	Data Type	Data Format	Local Memory Address	PLC Address Register	Tag Group Membership
Alarm State - Tank A	Monitor	Integer	102	102	Tank A
Alarm State - Tank B	Monitor	Integer	152	152	Well
Booster Pump Rate	Monitor	Integer	164	164	System
Limit Switch	Monitor	Integer	161	161	System
Lower Limit	Monitor	Integer	166	166	System
Pump Status	Monitor	Integer	168	168	System
Pump Status-Scaled	Monitor	Integer	168	168	System
System Alarm	Monitor	Integer	167	167	System
System Date	Monitor	Date	1		
System Time	Monitor	Time	4		
Upper Limit	Monitor	Integer	165	165	System
Water In Rate	Monitor	Integer	162	162	System
Water Level - Tank A	Monitor	Integer	101	101	Tank A
Water Level - Tank B	Monitor	Integer	151	151	Well
Water Out Rate - Tank A	Monitor	Integer	163	163	System
Water Out Rate - Tank B	Monitor	Integer	169	169	System
Well Run Mode	Monitor	Integer	181	181	System, Tank A, Well
Well Status	Monitor	Integer	182	182	System, Tank A, Well
Well Status-Scaled	Monitor	Integer	170	170	System, Tank A, Well

D.6.2 Mitsubishi Communications (Protocols and Drivers)

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with controllers from various manufacturers. This communication may take place using:

- A serial cable link to a serial comm port on your controller.
- An RF link to an RF access point on the controller.
- A TCP/IP link to a TCP/IP compatible controller.
- An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

> Please note that you must have the proper runtime engine installed on the target platform, and you must Register and Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

Mitsubishi Communication Protocols - Driver 87

The Mitsubishi driver supports the dedicated computer link protocols 1 to 4 with and without sum check and supports the programming port protocol for FX and FX2N controllers. The communication link is used to transfer information between the runtime platform and your controller according to the selected Mitsubishi serial protocol using the Master/Slave mode. The accessible memory types implemented in the standard release of InstantHMI Driver 87 are listed in the table below. If you need any additional functionality please contact Software Horizons.

Setting up your PLC for Proper Communications

InstantHMI uses a default setting of 9600 baud, no parity, 8 data bits, 1 stop bit.

Use this driver to communicate with Mitsubishi A-Series and FX-Series controllers using computer link protocol or FX and FX2N controllers using the FX programming port protocol. If your controller uses different communication settings than shown above make sure the InstantHMI Data Source reflects your controller. Please see Section D.6.1 of the InstantHMI Manual for more information on how to configure data sources. In the Data Source Editor click the 'Properties' button to select the appropriate protocol settings for your controller. If your controller is connected through a computer link port select the protocol 'Computer Link' and select the format and sum check settings to match your controller as shown below.

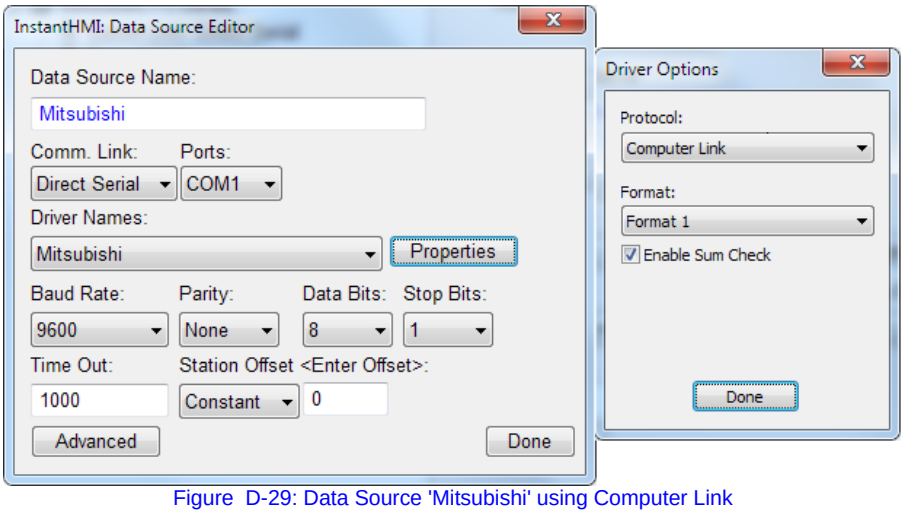


Figure D-29: Data Source 'Mitsubishi' using Computer Link

If your controller is a FX or FX2N series and is connected through the programming port select the protocol 'FX Programming Port' and select the PLC type FX or FX2N to match your controller as shown below. Typically communication settings for FX and FX2N controllers are 9600 baud, even parity, 7 data bits, and 1 stop bit.

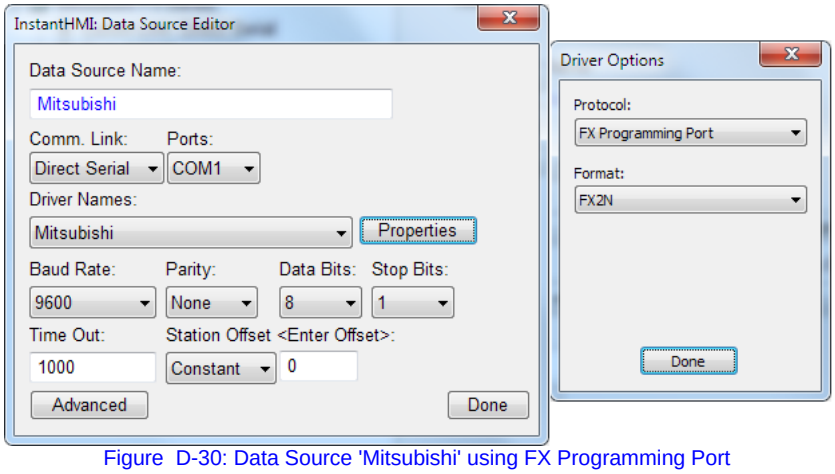


Figure D-30: Data Source 'Mitsubishi' using FX Programming Port

You may choose a lower/higher baud rate, or different Slave ID / Station Number if desired; make sure the InstantHMI Data Source reflects any changes you make. Please see Section D.6.1 of this Manual for more information on how to configure data sources.

If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your data source can be edited by tapping Setup → Comm Setup from the InstantHMI Main Menu on your PDA. See Section 3.1 in the InstantHMI Manual for more information.

Cable Connections

Connect the PLC to the RS-232C port of your runtime platform using cabling described in the appropriate Mitsubishi manual. Some PDAs or Windows CE devices may require a converter to communicate with the device (contact Software Horizons for further information).

Computer Link Protocol – A-Series Example

For the A-Series Controller using the A1SJ71C24-R2 Computer Link module note the control protocol format selected using the Mode Setting Switch and communication settings from the dip switches and make sure these settings match your InstantHMI Data Source.

Connect the 9-Pin port on A1SJ71C24-R2 Computer Link module to the RS-232C port of your runtime platform using a standard RS-232 serial cable. Some PDAs or Windows CE devices may require a converter to communicate with the device (contact Software Horizons for further information).

Computer Link Protocol – FX-485PC-IF Example

One of the following cable configurations should be used depending on your Mitsubishi network. For a more detailed description of RS-485 and RS-422 communication setup specific to the Mitsubishi PLC please refer to the Mitsubishi User's Manual FX-485PC-IF.

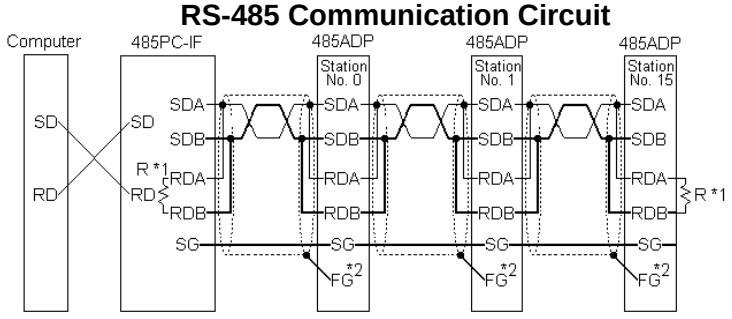


Figure D-31: Computer Link using RS-485 Communication Circuit

RS-422 Communication Circuit

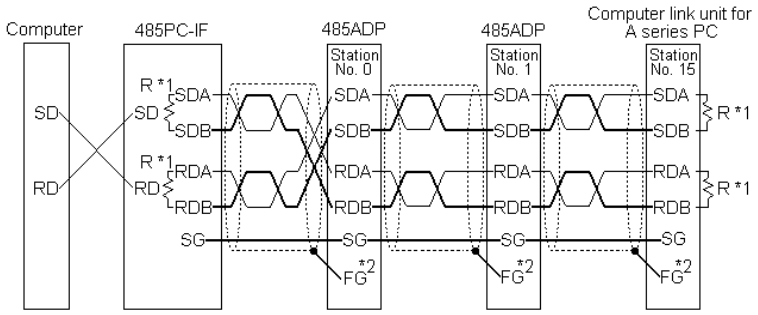


Figure D-32: Computer Link using RS-422 Communication Circuit

Mitsubishi Addressing

InstantHMI implements the Mitsubishi Computer Link and FX, FX2N Programming Port protocols. Programming Port uses Memory Map translation (performed by InstantHMI). You will use addresses compatible with your Ladder Logic as indicated in the Table below. The following memory Types are implemented in the standard release of InstantHMI Mitsubishi driver. If you need any additional functionality please contact Software Horizons.

Mitsubishi		**InstantHMI Data Specification**		
Memory Type	**PLC Address**	**Memory Type**	**InstantHMI Address**	**Remarks**
D	xxxx	Register	xxxx	Read or write data registers.
M	xxxx	Bit	xxxx	Read or write status of internal relays.
T	xxxx	Timer Current	xxxx	Read status of timers.
C	xxxx	Counter Current	xxxx	Read status of counters.
X	xxxx	Digital Input	xxxx	Read ON/OFF status of discrete inputs.
Y	xxxx	Digital Output	xxxx	Read or write ON/OFF status of discrete outputs.

Addressing Examples

These addresses may not be valid for your PLC, check your PLC documentation to ensure that you are using addresses that are supported by your specific PLC.

Mitsubishi		**InstantHMI Data Specification**	
Memory Type	**PLC Address**	**Memory Type**	**InstantHMI Address**
D	25	Register	25
M	50	Bit	50
T *	20	Timer Current	20
C *	10	Counter Current	10
X *	5	Digital Input	5
Y	17	Digital Output	17

* Read only

D.6.3 InstantHMI Drivers for Mitsubishi Controllers

Here is a summary of various drivers available for Mitsubishi PLC. We recommend driver 87, which has all the capabilities of drivers 17, 18, 38 and 48 and supports additional protocols as shown:

InstantHMI Driver #	Programming Port	Computer Link (Format)*				A Series	FX	FX2N	FX3G
		1	2	3	4				
17		X				X			
18	X						X		
38					X				
48	X							X	
87	X						X	X	
87		X	X	X	X	X	X	X	X

* May require 485-PC-IF interface module for wiring to the PLC; Format selection is made in PLC.

D.7 InstantHMI Designed for GPS Application

D.7.1 Introduction to GPS

GPS became fully operational (after about 20 years of development and a system cost of $12 billion) on July 17, 1995.

The GPS system in space consists of 6 orbital planes, each with 4 satellites in orbit at an altitude of 20,200km (12-hour orbit period), for a total of 24 satellites in the GPS Constellation. All satellites transmit at 1575.42MHz. Each satellite modulates using a unique 1023-bit pseudo-random (PRN) code sent at 1.023Mcps (chips per second). Measuring the time elapsed between the transmitted signal and received signal, helps determine receiver's distance to the satellite. GPS system data are transmitted using modulated PRN code at 50bps.

Ephemeris data is a table containing the predicted positions of artificial satellites orbiting the Earth. Each satellite has its own table that details its exact point in space and time. This data is essential for determining location via GPS.

Typical GPS Receivers cost between $60 and $160. The interface is single or dual serial port. Protocols include NMEA-0183, Trimble (TSIP and TAIP), Garmin, etc.

D.7.2 GPS Serial Protocol (NMEA)

NMEA-0183 (National Marine Electronics Association) is the protocol for navigation data exchange among marine electronics (GPS, LORAN, auto-pilot, etc) available on nearly every commercial GPS with a serial port. NMEA ASCII comma-delimited protocol string examples:

$GPGGA – GPS fix data message (latitude, longitude, time, # satellites, etc)
$GPGGL – Geographic position (latitude, longitude, time)
$GPGSA – GPS DOP (dilution of precision) and active satellites (# satellites, P/H/V DOP)
$GPGSV – GPS satellites in view (satellite elevation/azimuth, SNR, etc)
$GPVTG – GPS velocity and heading
$GPZDA – Time & Date message

NMEA strings are followed by a precisely defined number of data fields. Not all of the above strings may be accessible in a specific receiver implementation.

Communication Link

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with GPS receivers from various manufacturers. Due to inherent mobility of GPS receivers, the mobile PDA platforms will be the most appropriate. Some PDA manufacturers have integrated GPS receivers in the PDA. One such device (TDS Nomad) is available from Software Horizons with InstantHMI runtime pre-installed, pre-tested and 'ready to go'.

In case of integrated (internal) GPS receivers no external communication link is necessary. If the GPS receiver is external to the InstantHMI platform, this communication may take place using:

- A serial cable link to a serial comm port on your GPS receiver.
- A Bluetooth RF link to your Bluetooth enabled GPS receiver.

Connect the GPS receiver to the RS-232C port of your runtime platform using a standard RS-232 Cable. Some PDAs or Windows CE devices may require a converter to communicate with the device (contact Software Horizons for further information). If your receiver does not support Wireless Bluetooth communications you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection.

> Please note that you must have the proper runtime engine installed on the target platform, and you must Register and Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

Data Source

Define the Data Source 'GPS Serial' as shown in Figure D-26. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name: GPS NMEA
- Comm Link: Direct Serial
- Port: COM2
- Baud Rate: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Time Out: 1000 (msec - default)
- Station Offset: 0

We have chosen Station Offset: 0 to match the (only) GPS receiver in our setup. Choose all driver options to suit your own GPS receiver.

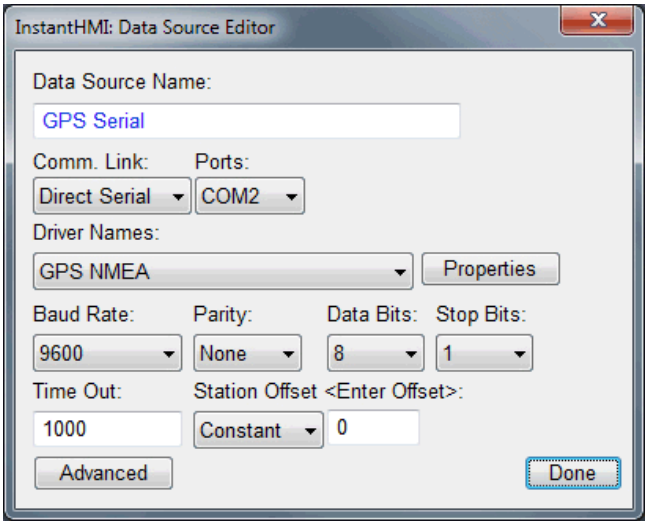


Figure D-33: Data Source Definition 'GPS-Serial'

At this point, the Runtime provides access to all GPS variables. You may implement your own screens and tags to drive your application behavior as desired. For example the GPS tag 'GPS-Longitude' may be defined as follows:

GPS-Longitude (String)

'Pick and Place' # object on screen and enter the following Display Object Properties:

a) Display Format: Text (Alpha)
b) Field Width: 16
c) Font: Select appropriate font
d) Foreground and Background Color: Select as desired
e) Select Tag → Tag Manager → New Tag and in the Tag Editor dialog enter tag definition as follows:

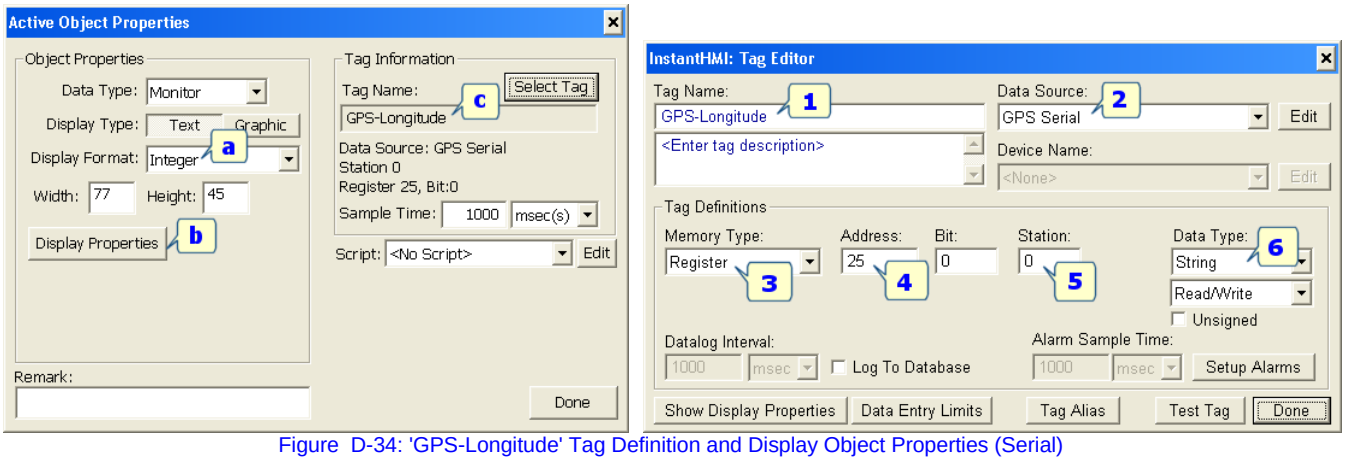


Figure D-34: 'GPS-Longitude' Tag Definition and Display Object Properties (Serial)

GPS-Longitude Tag Definition

1 Tag Name : 'GPS-Longitude'
2 Data Source : 'GPS Serial'
3 Memory Type: 'Register'
4 Address : 25 (see memory mapping in the table below)
5 Station : 0
6 Data Type : String

The tag definition for GPS-Longitude is complete.

GPS Serial (NMEA) Protocol Driver 66

The communication link is used to transfer information between the runtime platform and your GPS receiver according to the GPS NMEA serial protocol.

InstantHMI uses a default setting of 9600 baud, no parity, 8 data bits, 1 stop bit. You may choose a lower/higher baud rate if desired; make sure the InstantHMI Data Source reflects any changes you make. Please see data source above of this Manual for more information on how to configure data sources.

Note: If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your data source can be edited by tapping Setup → Comm Setup from the InstantHMI Main Menu on your PDA. See Section 3.1 in the InstantHMI Manual for more information.

Some Considerations in using GPS

We illustrate some of the considerations in using a GPS receiver using the TDS Nomad as the InstantHMI runtime platform. You should look at the documentation for your GPS receiver for similar useful information.

Acquiring a GPS position fix InstantHMI driver can acquire the information on the GPS variables only after your GPS receiver has acquired a position fix. 'Time to First Fix' (TTFF) is the time required for this process. If the TDS Nomad GPS receiver has had a recent position fix, then it has some knowledge of the current locations of the GPS satellites, which can be used to acquire a new position fix in a few seconds. If the receiver's knowledge of the satellite locations is older than about two hours, the TTFF can take several minutes or longer (depending on satellite signal-to-noise ratio, number of visible satellites, etc.).

Steps you can take to improve your Nomad receiver's TTFF:

- Run the Nomad-InstantHMI GPS application and try to obtain a fix while you are driving to the job site. The Nomad will download ephemeris data from any visible satellites during the drive. This data is essential for determining location via GPS.
- Try to find an area with as much open sky as possible while acquiring a position fix. Trees, buildings, mountains, and other large objects block parts of the sky, and can prevent the Nomad GPS receiver from being able to see some of the satellites. Once you have a fix, the Nomad GPS receiver will typically retain the fix even if you enter a forest canopy or other challenging environment.

- The GPS signal is very weak and easy to block. The Nomad GPS antenna is located under the power button, near the bottom. Try setting the Nomad on a table or other surface; or try holding the Nomad with its cap towards your body and GPS antenna directed away from your body.

Using the Intermediate GPS Driver The Microsoft Intermediate GPS Driver allows multiple GPS-aware applications to simultaneously receive data from a GPS receiver. If you only run only InstantHMI, then you do not need to enable or configure the Intermediate GPS Driver. However, if you have difficulty in getting the first GPS fix you may enable the Intermediate GPS Driver:
(**Start → Settings → System → GPS → Access**, and check the box "Manage GPS automatically". Open the **Hardware** tab to set the GPS hardware port:

- For Nomad's built-in GPS receiver use COM2.
- For external GPS receiver connected to Nomad's (optional) 9 pin port, use COM1.
- For a Bluetooth GPS receiver use the serial port assigned to the Bluetooth receiver.

Open the **Programs** tab to set the GPS program port to any available port. InstantHMI Data Source can be set to use GPS program port to receive GPS data.

Addressing (Memory Mapping)

InstantHMI implements the GPS NMEA communications protocol. You should refer to the GPS Receiver manuals for any device specific information. The following GPS variables are accessible in the standard release of InstantHMI driver #66.

GPS Receiver	InstantHMI Data Specification				
Variable (Tag Name)*	**Memory Type**	**Data Type**	**Address**	**Data Format**	**Field Width**
GPS-UTC Hour	Register	Int16	1	Integer	5
GPS-UTC Min	Register	Int16	2	Integer	5
GPS-UTC Seconds	Register	Int16	3	Integer	5
GPS-UTC msecs	Register	Int16	4	Integer	5
GPS-Fix Status	Register	Int16	5	Integer	5
GPS-Sats In View	Register	Int16	6	Integer	5
GPS-Sats In Use	Register	Int16	7	Integer	5
GPS-Altitude	Register	Int16	8	Integer	5
GPS-MPH	Register	Int16	9	Integer	5
GPS-Latitude Degrees	Register	Int16	11	Integer	5
GPS-Latitude Minutes	Register	Int16	12	Integer	5
GPS-Latitude Seconds	Register	Int16	13	Integer	5
GPS-Latitude mSecs	Register	Int16	14	Integer	5
GPS-Latitude	Register	Int16	15	String	15
Reserved for later use **			16-20		
GPS-Longitude Degrees	Register	Int16	21	Integer	5
GPS-Longitude Minutes	Register	Int16	22	Integer	5
GPS-Longitude Seconds	Register	Int16	23	Integer	5
GPS-Longitude mSecs	Register	Int16	24	Integer	5
GPS-Longitude	Register	Int16	25	String	15
Reserved for later use **			26-56		

***** All Variables are READ ONLY (UTC stands for Coordinated Universal Time)
****** If you need any additional functions please contact Software Horizons.

D.7.3 Example: Pipeline Monitoring Application

To illustrate GPS application, which must be mobile, we use a PDA based OEM Version of InstantHMI designed for Pipeline Monitoring.

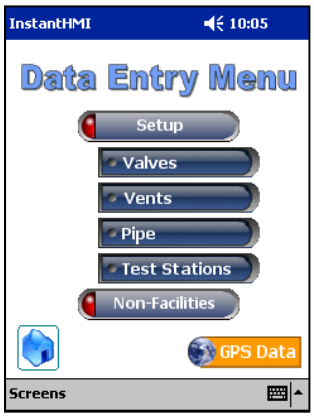
You may use our illustration as a guide and design your own screens etc. using the InstantHMI LaunchPad Designer. If you require any special functions, which are not available in standard version of InstantHMI, please contact Software Horizons. Software Horizons offers its services to enhance InstantHMI (for Pocket PC, or other hardware platforms) to provide additional functionality for OEMs and other customers with special requirements. Such customized versions may include customized databases (Tags, Messages, Troubleshoot etc.) and/or additional screens including a Splash Screen, Startup Menu Screen with buttons tailored to provide the end users easy access to the functions provided by the OEM's product.

Splash Screen

InstantHMI designed for Pipeline Monitoring at startup will display the **Splash Screen** shown below. Tap on 'Your Company' Logo or **Enter Data** button to go to the Data Entry Menu screen.

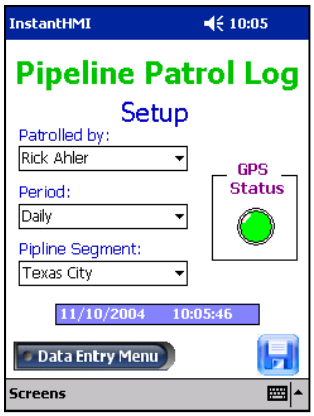
Data Entry Menu

This screen contains several buttons to provide the functionality described below. Tap any of the menu buttons to navigate to the corresponding screen. Tap on **GPS Data** button to find out your current position (Latitude, Longitude etc.). Tap on **Home** graphic button to return to the Splash Screen.



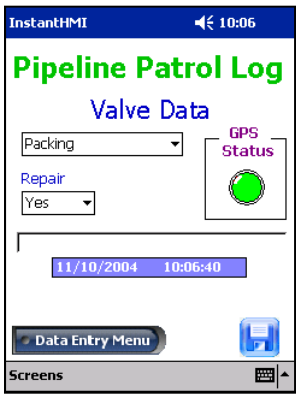
Setup Screen

If you tap the **Setup** button on the Data Entry Menu screen, to switch to the Setup Screen. On Setup screen you will see an LED**,** which indicates GPS Status: Red indicates 'waiting for GPS data' and Green indicates receiving GPS data. After making any desired changes on the Setup screen tap on the Disk graphic button to save setup parameters into CSV file for later review. Data will be stored into CSV file only if GPS Status LED is green. Note the current Date/Time displayed at the bottom of the screen.



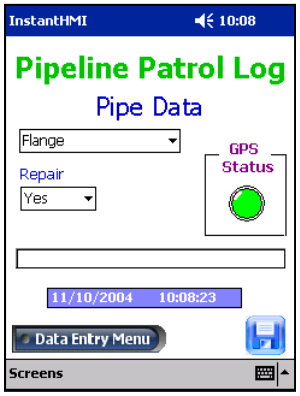
Valve Data

If you tap the Valve Data button on the Data Entry Menu screen, you will see the Valve Data parameters screen. After making any desired changes on the Valve Data screen tap on the Disk graphic button to save setup parameters into CSV file for later review. Data will be stored into CSV file only if GPS Status LED is green.



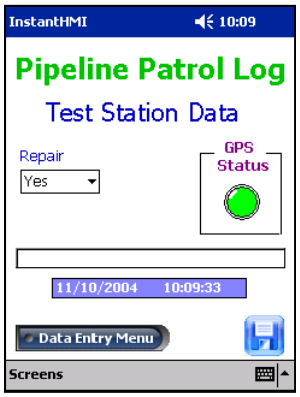
Pipe Data

If you tap the Pipe Data button on the Data Entry Menu screen, you will see the Pipe Data parameters screen. After making any desired changes on the Pipe Data screen tap on the Disk graphic button to save setup parameters into CSV file for later review. Data will be stored into CSV file only if GPS Status LED is green.



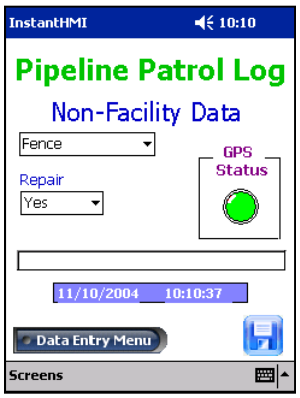
Test Station Data

If you tap the Test Station Data button on the Data Entry Menu screen, you will see the Test Station Data parameters screen. After making any desired changes on the Test Station Data screen tap on the Disk graphic button to save setup parameters into CSV file for later review. Data will be stored into CSV file only if GPS Status LED is green.



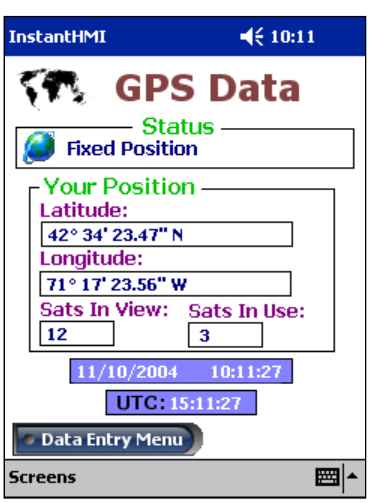
Non-Facility Data

If you tap the Non-Facility Data button on the Data Entry Menu screen, you will see the Non-Facility Data parameters screen. After making any desired changes on the Non-Facility Data screen tap on the Disk graphic button to save setup parameters into CSV file for later review. Data will be stored into CSV file only if GPS Status LED is green.



GPS Data

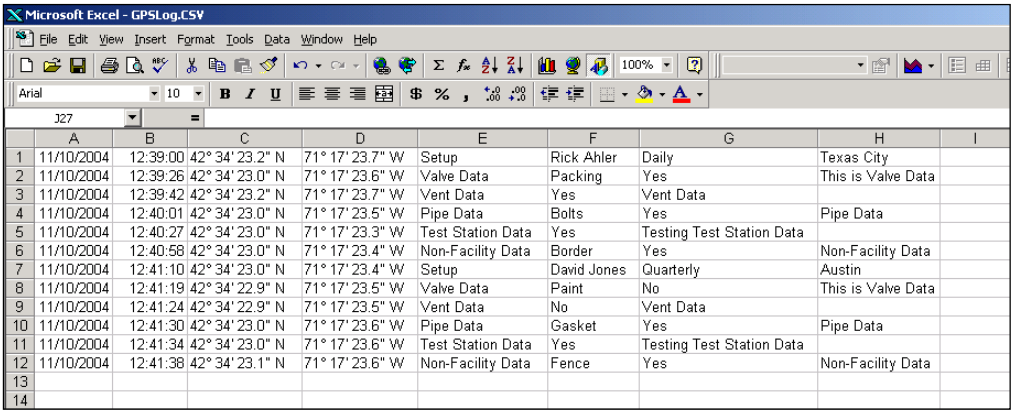
If you wish to see the GPS data tap on the GPS Data button on the Data Entry Menu screen. You will see the following GPS Data parameters screen.



The Status field will display 'Fixing Position…' when the GPS receiver is trying to get GPS Data. When GPS data is valid, the Status field will display 'Fixed Position' or '3D Differential Fix'. The screen will show your position in terms of Latitude and Longitude in degrees, minutes and seconds**.** Note the current Date/Time displayed at the bottom of the screen. Tap on **Data Entry Menu** button to go to that screen.

D.7.4 Logged File in CSV Format

A sample log CSV file imported in Excel is shown below. The data includes Date, Time, Longitude, Latitude, Data/Screen Name and corresponding screen parameters.


Microsoft Excel - GPSLog.CSV

File Edit View Insert Format Tools Data Window Help

Arial 10 J27

	A	B	C	D	E	F	G	H	I
1	11/10/2004	12:39:00	42° 34' 23.2" N	71° 17' 23.7" W	Setup	Rick Ahler	Daily	Texas City	
2	11/10/2004	12:39:26	42° 34' 23.0" N	71° 17' 23.6" W	Valve Data	Packing	Yes	This is Valve Data	
3	11/10/2004	12:39:42	42° 34' 23.2" N	71° 17' 23.7" W	Vent Data	Yes	Vent Data		
4	11/10/2004	12:40:01	42° 34' 23.0" N	71° 17' 23.5" W	Pipe Data	Bolts	Yes	Pipe Data	
5	11/10/2004	12:40:27	42° 34' 23.0" N	71° 17' 23.3" W	Test Station Data	Yes	Testing Test Station Data		
6	11/10/2004	12:40:58	42° 34' 23.0" N	71° 17' 23.4" W	Non-Facility Data	Border	Yes	Non-Facility Data	
7	11/10/2004	12:41:10	42° 34' 23.0" N	71° 17' 23.4" W	Setup	David Jones	Quarterly	Austin	
8	11/10/2004	12:41:19	42° 34' 22.9" N	71° 17' 23.5" W	Valve Data	Paint	No	This is Valve Data	
9	11/10/2004	12:41:24	42° 34' 22.9" N	71° 17' 23.5" W	Vent Data	No	Vent Data		
10	11/10/2004	12:41:30	42° 34' 23.0" N	71° 17' 23.6" W	Pipe Data	Gasket	Yes	Pipe Data	
11	11/10/2004	12:41:34	42° 34' 23.0" N	71° 17' 23.6" W	Test Station Data	Yes	Testing Test Station Data		
12	11/10/2004	12:41:38	42° 34' 23.1" N	71° 17' 23.6" W	Non-Facility Data	Fence	Yes	Non-Facility Data	
13									
14									

D.7.5 Sample Tag Database

GPS Tag Variables (Register Memory)

Tag Name	Memory Address	Memory Type	Data Format	Field Width
UTC Hour	1	Register	Integer	5
UTC Min	2	Register	Integer	5
UTC Seconds	3	Register	Integer	5
UTC msecs	4	Register	Integer	5
Fix Status	5	Register	Integer	5
Sats In View	6	Register	Integer	5
Sats In Use	7	Register	Integer	5
Altitude	8	Register	Integer	5
MPH	9	Register	Integer	5
Latitude Degrees	11	Register	Integer	5
Latitude Minutes	12	Register	Integer	5
Latitude Seconds	13	Register	Integer	5
Latitude mSecs	14	Register	Integer	5
Latitude	15	Register	String	15
Longitude Degrees	21	Register	Integer	5
Longitude Minutes	22	Register	Integer	5
Longitude Seconds	23	Register	Integer	5
Longitude mSecs	24	Register	Integer	5
Longitude	25	Register	String	15

Other Tag Variables (Local Memory)

Screen Name	Tag Name	Memory Address	Memory Type	Data Format	Field Width
GPS Data	Date	2	Local	String	16
GPS Data	Time	3	Local	Integer	16
Setup	Patrolled By	101	Local	String	30
Setup	Period	131	Local	String	30
Setup	Pipline Segment	161	Local	String	30
Valve Data	Valve Tag1	231	Local	String	30
Valve Data	Valve Tag2	261	Local	String	10
Valve Data	Valve Tag3	271	Local	String	30
Vent Data	Vent Tag1	301	Local	String	10
Vent Data	Vent Tag2	311	Local	String	30
Pipe Data	Pipe Tag1	401	Local	String	30
Pipe Data	Pipe Tag2	431	Local	String	10
Pipe Data	Pipe Tag3	441	Local	String	30
Test Station	Test Station1	501	Local	String	10
Test Station	Test Station2	511	Local	String	30
Non Facility	Non Facility1	601	Local	String	30
Non Facility	Non Facility2	631	Local	String	5
Non Facility	Non Facility3	641	Local	String	30
Setup	Setup Form	1001	Local	Integer	5
Valve Data	Valve Data	1002	Local	Integer	5
Pipe Data	Pipe Data	1003	Local	Integer	5
Test Station	Test Station Data	1004	Local	Integer	5
Vent Data	Vent Data	1005	Local	Integer	5
Non Facility	Non Facility Data	1006	Local	Integer	5

D.8 Solution for SeaLevel SeaPAC R9 Onboard I/O

For training purposes, to explain the design of screens and screen objects independent of the physical I/O, initially we avoided the use of the physical I/O and used a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the controller). This Simulation Approach did not require us to define a Data Source for the Local Memory in the PC Simulation of the controller; nor did we need to worry about the Communication Link between the Runtime Platform and the I/O. However, to use the onboard I/O from the SeaLevel SeaPAC R9 you must define a Data Source.

This Appendix may be used for SeaLevel SeaPAC R9 panels. Please refer to Memory Map for SeaPAC R9 (Section D.8.2) if you wish to implement the Water Supply System control logic in your panel and define I/O tags.

D.8.1 SeaLevel SeaPAC R9 Onboard I/O

The SeaLevel SeaPAC R9 Windows CE touch panel has eight onboard open collector outputs, one Status LED and Software Reset functions that can be controlled through InstantHMI using the SeaLevel SeaPAC IO driver. InstantHMI running on this device can turn these outputs on/off, turn the Status LED on/off and use the Software Reset function to reset the panel if desired. Below is an example of how to configure the Data Source to access the SeaPAC I/O.

Data Source

Define the Data Source 'SeaPAC' as shown in Figure D-35. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name: SeaLevel SeaPAC IO
- Comm Link: Direct Serial
- Port: Com1
- Baud Rate: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Time Out: 1000 (msec - default)
- Station Offset: 0

Note: Only the Driver Name parameter is necessary to use the onboard I/O. All other parameters are ignored for this driver.

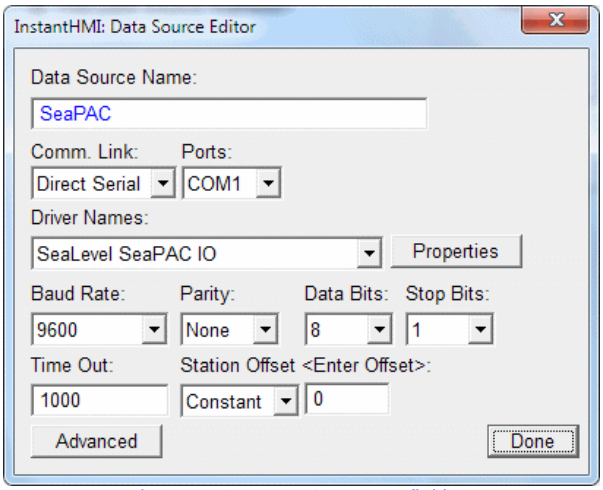


Figure D-35: Data Source Definition

At this point, the Runtime script still controls the simulation and the old tag definitions can be used without change. To switch to SeaPAC tags, you will need to associate the data source we just defined with each tag in the Tag Database (except Date and Time, which remain Local Memory tags). This automatically associates the screen objects with controller tags as opposed to the Local memory tags previously used in the simulation. For example the tag 'Well Status' may be defined as follows:

Well Status Display Object (LED)

a) Display Format: 'Pick and Place' LED object on screen produces this property window.
b) Enter LED Properties:
c) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

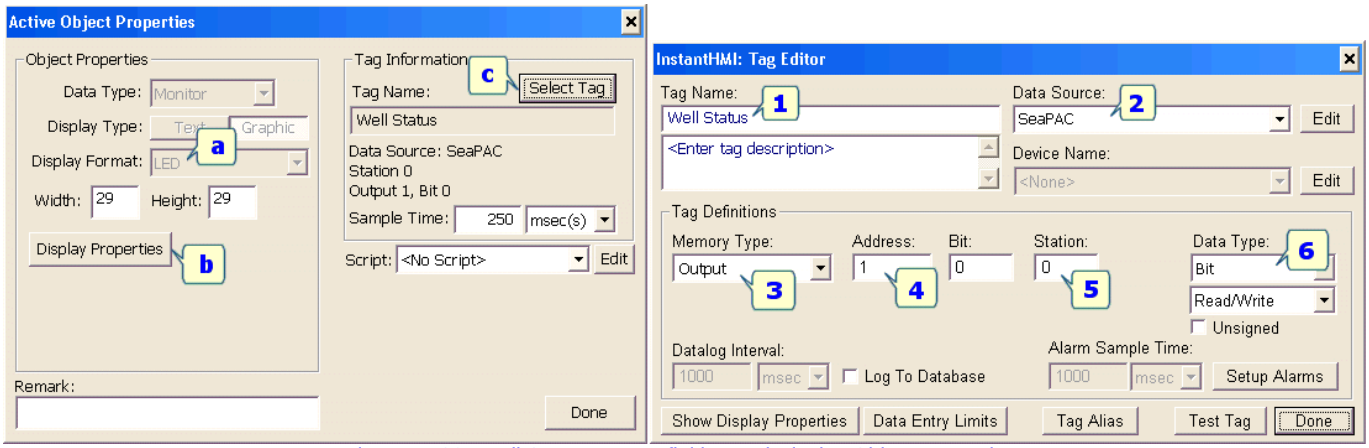


Figure D-36: 'Well Status' Tag Definition and Display Object Properties

Tank Level Tag Definition

1 Tag Name: 'Well Status'
2 Data Source: 'SeaPAC'
3 Memory Type: 'Output'
4 Address: 1
6 Data Type: Bit

D.8.2 SeaLevel SeaPAC R9 Onboard I/O Driver

The SeaLevel SeaPAC I/O driver supports the eight Open Collector Outputs, STAT LED and Software Reset built into SeaPAC R9 Windows CE touch panel. The Outputs to be accessed by InstantHMI can be setup by clicking the 'Properties' button in the Data Source editor. Check the output functions you want InstantHMI to be able to access, select the start up value type, default value, and attributes for the function. If 'Default' is set as the startup value then the 'Default Value' specified will be used to initialize the output function. If 'Last Known' is set as the startup value then the last known value for the output will be used to initialize the output function. If the last value for the output is not known then the 'Default Value' will be used for initialization. The Status LED function allows you to turn the STAT LED on the panel on and off. The SW Reset function will perform a soft reset (reboot of the panel) when set.

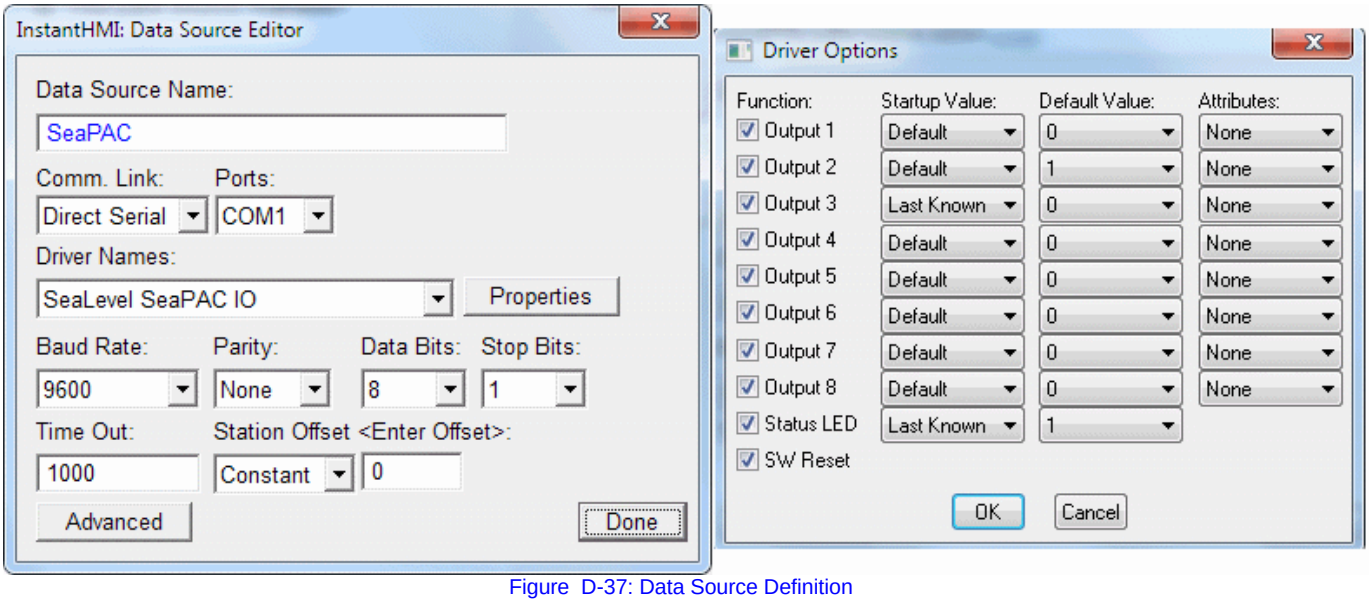


Figure D-37: Data Source Definition

Onboard I/O Addressing

The following memory Types are implemented in the standard release of InstantHMI SeaLevel SeaPAC I/O driver. If you need any additional functionality please contact Software Horizons.

SeaLevel SeaPAC R9 Panel		InstantHMI Data Specification		
Memory Type	**Output Address**	**Memory Type**	**InstantHMI Address**	**Remarks**
Open Collector Output	1 – 8	Output	1 – 8	Read or write open collector outputs.
STAT LED	NA	Status LED	1	Read or write Status LED.
SW_RESET	NA	Soft Reset	1	Reset Panel

D.9 Solution for Toshiba Controllers

For training purposes, to explain the design of screens and screen objects independent of the PLC, initially we avoided the use of the PLC and used a '**Simulation Approach**' (Runtime script and Local Memory in the runtime platform to simulate the control logic normally programmed in the PLC). This Simulation Approach did not require us to define a Data Source for the Local Memory in the PC Simulation of the PLC; nor did we need to worry about the Communication Link between the Runtime Platform and the PLC. However, to use data registers and I/O from Toshiba PLC (connected by Serial or Ethernet link to PC InstantHMI Runtime Engine) you must define a Data Source for your PLC.

This Appendix may be used for any Toshiba controllers. Please refer to Memory Map for Toshiba PLC (Addressing Section D.9.3) if you wish to implement the Water Supply System control logic in your PLC and define PLC tags.

InstantHMI uses various communication protocols to communicate with the Toshiba PLCs. Section D.9.1 covers the serial Toshiba protocol using the Binary Transmission mode. Section D.9.2 covers the Toshiba Ethernet (Modbus TCP) protocol.

Note on Toshiba PLCs:
Old T Series: T1, T2, T3 and T3H; V Series: V1000, V2000, V3000 are modular PLCs.
V Series with S2E and S2T CPUs are compatible with T Series (T3 and T3H) except for the increased Register Range beyond T1, T2. The S2E/S2T are simply the shrink CPUs of the Toshiba's T3H CPUs.
V200 Series are Modbus compatible and for these PLCs you may use InstantHMI Modbus Drivers.
The GWY-610-B device is a Protocol converter (old Toshiba protocol to Modbus).
The letter G stands for the V-Series; the modules are GDI (digital in) GRO (Relay output) etc.
GPU200 * 3S Ethernet Configuration supports Modbus TCP.

D.9.1 Toshiba Serial Protocol

Communication Link

Connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) using a serial cable to your PLC. If wireless link is desired, suitable adapter kits for your PLC (Serial-Infrared, Serial-WiFi, Serial-Bluetooth) are available from Software Horizons.

Data Source

Define the Data Source ' Toshiba Serial' as shown in Figure D-38. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the various parameters in the Data Source definition:

- Driver Name: Toshiba T-Series
- Comm Link: Direct Serial
- Port: Com1
- Baud Rate: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Time Out: 1000 (msec - default)
- Station Offset: 0

We have chosen Station Offset: 0 to match the PLC in our setup. In addition, in the driver properties we have selected Comm Mode to be RTU (as opposed to Ascii). Other driver options may be chosen to suit your own controller.

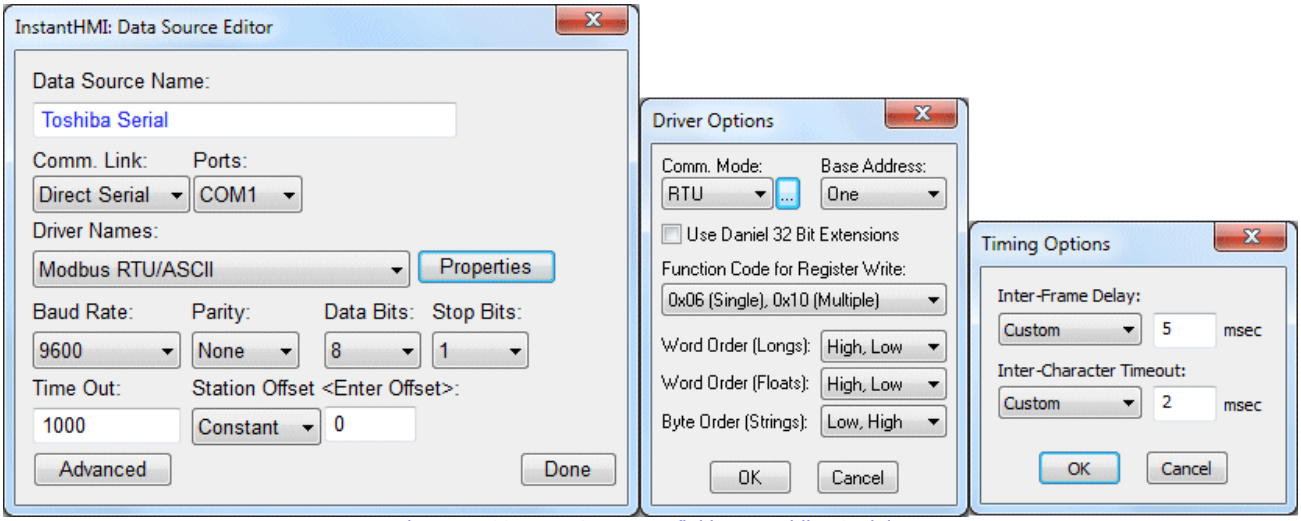


Figure D-38: Data Source Definition ' Toshiba-Serial'

At this point, the Runtime script still controls the simulation and the old tag definitions can be used without change. You may implement your own logic in the PLC and remove the runtime script from the project for your PLC logic to drive the Water Supply System behavior. To switch to PLC tags, you will need to associate the data source we just defined with each tag in the Tag Database (except Date and Time, which remain Local Memory tags). This automatically associates the screen objects with PLC tags as opposed to the Local memory tags previously used in the simulation. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

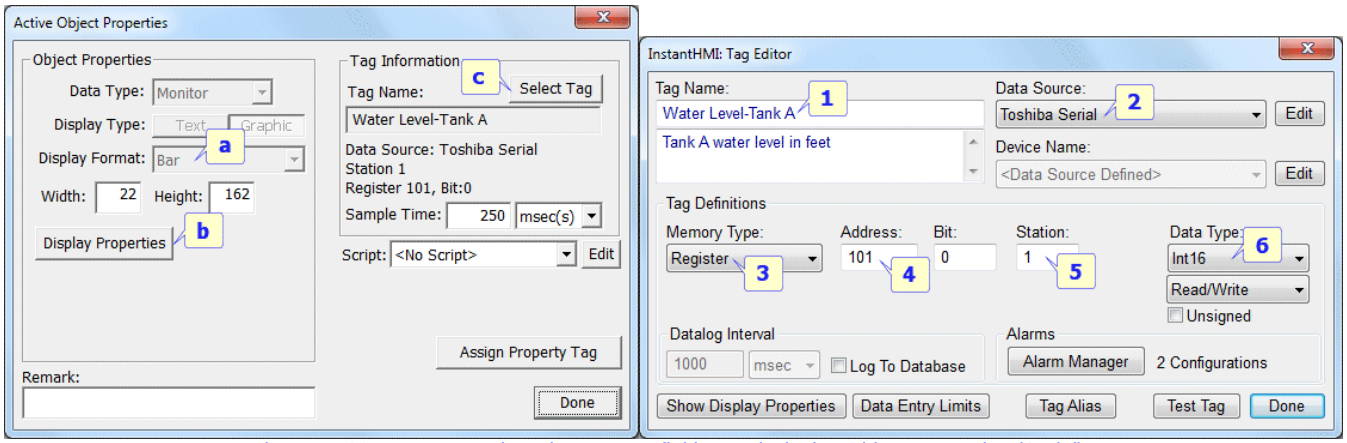


Figure D-39: 'Water Level-Tank A' Tag Definition and Display Object Properties (Serial)

Tank Level Tag Definition

1 Tag Name: 'Water Level -Tank A'
2 Data Source: ' Toshiba-Serial'
3 Memory Type: 'Register'
4 Address: 101
5 Station: '1' (should match your PLC)
6 Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

The table of Local Memory tags (variables of interest) used in the simulation is repeated below. Note that we have included a column labeled 'PLC Address' next to the Local Memory Address

column. PLC Address column defines the register memory tags in the PLC. This re-defines all the tags to suit your PLC.

Tag Name	Data Type	Data Format	Local Memory Address	PLC Address Register	Tag Group Membership
Alarm State - Tank A	Monitor	Integer	102	400102	Tank A
Alarm State - Tank B	Monitor	Integer	152	400152	Well
Booster Pump Rate	Monitor	Integer	164	400164	System
Limit Switch	Monitor	Integer	161	400161	System
Lower Limit	Monitor	Integer	166	400166	System
Pump Status	Monitor	Integer	168	400168	System
Pump Status-Scaled	Monitor	Integer	168	400171	System
System Alarm	Monitor	Integer	167	400167	System
System Date	Monitor	Date	1		
System Time	Monitor	Time	4		
Upper Limit	Monitor	Integer	165	400165	System
Water In Rate	Monitor	Integer	162	400162	System
Water Level - Tank A	Monitor	Integer	101	400101	Tank A
Water Level - Tank B	Monitor	Integer	151	400151	Well
Water Out Rate - Tank A	Monitor	Integer	163	400163	System
Water Out Rate - Tank B	Monitor	Integer	169	400169	System
Well Run Mode	Monitor	Integer	181	400181	System, Tank A, Well
Well Status	Monitor	Integer	182	400182	System, Tank A, Well
Well Status-Scaled	Monitor	Integer	170	400170	System, Tank A, Well

D.9.2 Toshiba Ethernet (Modbus TCP) Protocol

The discussion in Section D.9.2 (Toshiba Serial Protocol) applies here as well. The only changes are as follows:

Communication Link

You connect your InstantHMI Runtime platform (PC, Pocket PC or Window CE) over Ethernet link instead of using serial cable. If wireless link is desired, suitable adapter kits (Ethernet-Infrared, Ethernet-WiFi) are available from Software Horizons.

Data Source

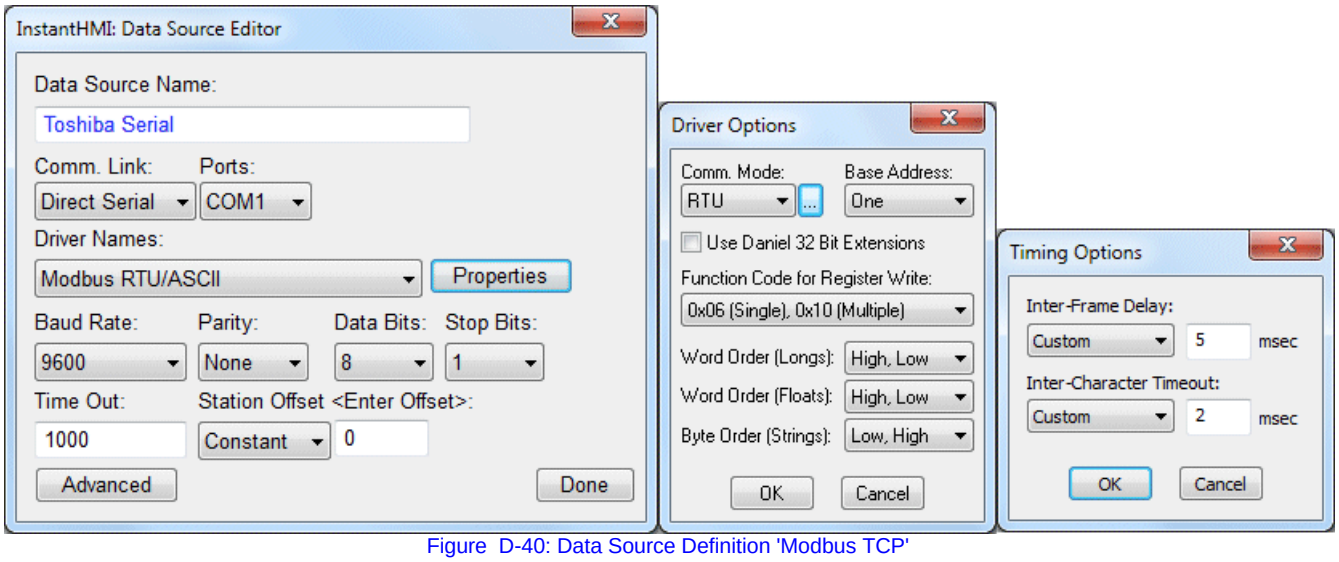


Figure D-40: Data Source Definition 'Modbus TCP'

Here the 'Modbus TCP ' data source is defined as shown in Figure D-40. (You may invoke the Data Source editor by clicking on the 'Edit Data Source' button in the tag editor). Note the following:

- Driver Name: Modbus TCP
- Comm Link: TCP/IP - RF
- Device Name: Modbus Controller

- Time Out: 1000 (msec - default)

Associate this data source with each tag (Note: if you use the old name 'Toshiba Serial' - Section D.9.1- but only change the definition as shown here, then the old tag definitions can be used without change). For illustration, we have used a new Data Source name 'Modbus TCP' (to emphasize the Ethernet Link) and changed the data source reference in each tag accordingly. For example the PLC tag 'Water Level - Tank A' may be defined as follows:

Tank Level Display Object (Bar)

a) Display Format: 'Pick and Place' Bar object on screen produces this property
b) Enter Bar Properties: Vertical, High Value '32' and Low Value '0'
c) Fill Color and Background Color as desired
d) Select Tag → Tag Manager → New Tag and enter tag definition as follows:

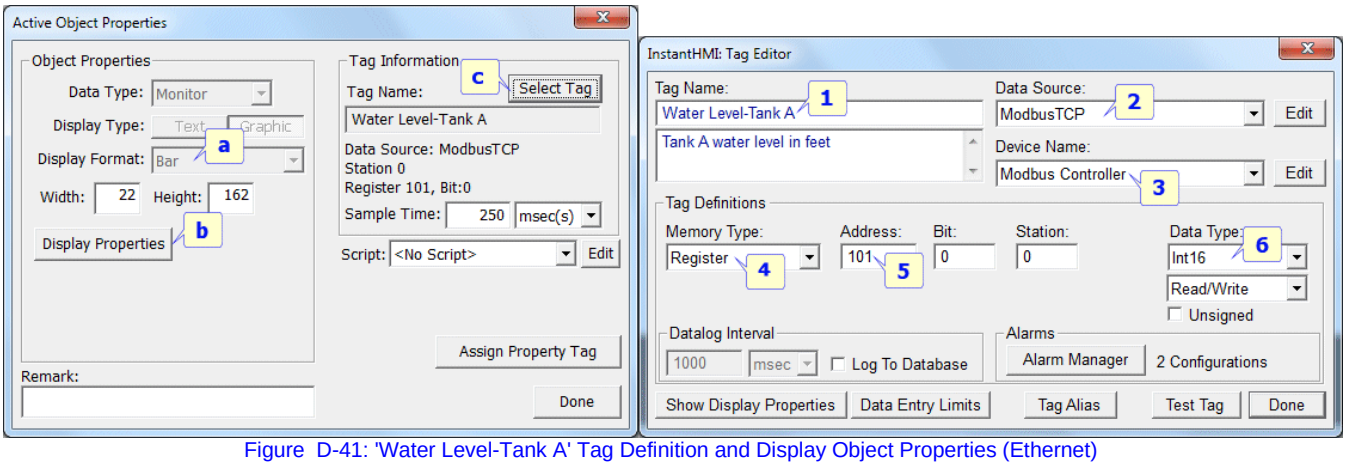


Figure D-41: 'Water Level-Tank A' Tag Definition and Display Object Properties (Ethernet)

Tank Level Tag Definition

1. Tag Name: 'Water Level - Tank A'
2. Data Source: 'Modbus TCP'
3. Memory Type: 'Register'
4. Address: '101',
5. Device Name: 'Modbus Controller' (should match PLC IP Address etc.)
6. Data Type: Int16 (default)

The Bar definition for Tank A level is complete.

D.9.3 Toshiba Communications (Protocols and Drivers)

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC) device - to communicate with controllers from various manufacturers. This communication may take place using:

- A serial cable link to a serial comm port on your controller.
- An RF link to an RF access point on the controller.
- A TCP/IP link to a TCP/IP compatible controller.
- An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

Please note that you must have the proper runtime engine installed on the target platform, and you must Register and Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

Toshiba Serial Communication Protocol-Driver 10

Note: Old Driver 14 (for older Toshiba PLC models EX14B, EX20+, EX40+, EX40H, EX28B, and Cutler Hammer D100) is obsolete and no longer supported. Old Driver 16 for Toshiba EC300 Loop Controller is also obsolete and no longer supported.

The communication link is used to transfer information between the runtime platform and your controller according to Toshiba protocol. The functions implemented in the standard release of InstantHMI Drivers 10 are listed in Addressing Section D.9.2. If you need any additional functions please contact Software Horizons.

Setting up your PLC for Proper Communications

InstantHMI uses a default setting of 9600 baud, no parity, 8 data bits, 1 stop bit. The Station Number is configurable via PLC configuration software (factory default is usually 1).

Step 1: Follow detailed installation instructions for your controller users manual to set up your PLC, modules and cabling.

Step 2: Make sure the PLC, modules and cables are installed correctly by testing your installation using Controller Programming software.

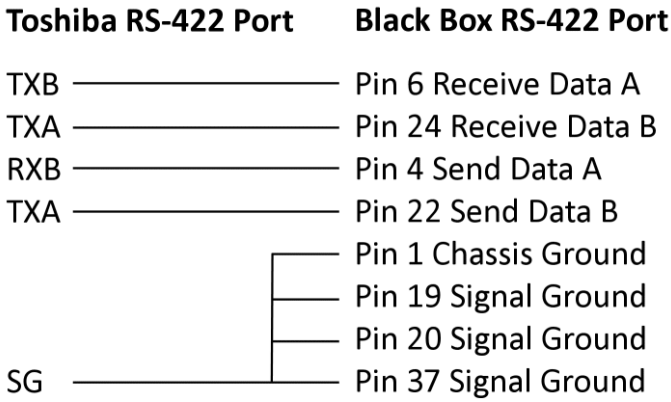
If you choose a lower/higher baud rate, or different Station Number; make sure the InstantHMI Data Source reflects any changes you make. Please see Section D.9.1 of this Manual for more information on how to configure data sources.

If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your data source can be edited by tapping Setup -> Comm Setup from the InstantHMI Main Menu on your PDA (See Section 3.1 in the InstantHMI Manual for more information).

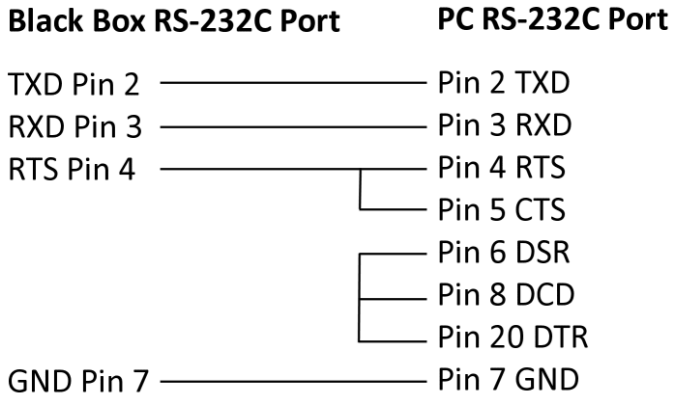
Serial Cable Connections

Connect the PLC (EX-100, EX200B, EX500, M20, M40) Comm Link RS-422 port to the RS-232C port of your runtime platform using an RS-232 to RS-422 Converter (Cable 1) and connect the RS-232 port on the converter to your PC using cable 2. We will show cable 1 and 2 for Black Box Converter and B&B converter.

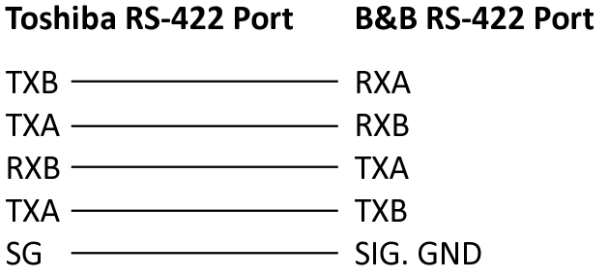
Cable 1 Pin connections using Black Box RS232 - RS422 converter



Cable 2 Pin connections using Black Box converter



Cable 1 connections using B&B Electronics RS232-RS422 converter (422LPCOR)



Cable 2 for B&B converter is a simple 25 pin straight through cable.

If you are using a Toshiba Programmable Controller Model EX100 (or EX200B, EX500, M20, M40) carefully follow the installation instructions in the appropriate Toshiba Manual. **Note:** This driver also works for Cutler Hammer Models D200, D500.

For the EX100 Controller select Link mode of transmission with the following parameters:

Baud Rate: 9600
Parity: None
Stop Bits: 1
Data Bits: 8

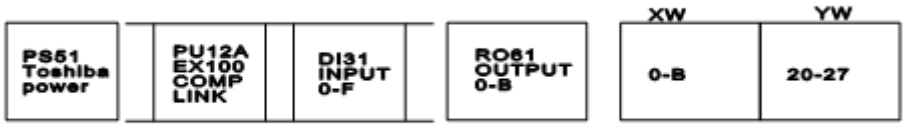
You may choose a different baud rate if desired.
InstantHMI implements the Toshiba protocol using the Binary transmission mode, BCC error checking. The functions implemented in the standard release of InstantHMI Driver 10 (Toshiba) are listed in the Table below. If you need any additional functions please contact Software Horizons.

Toshiba PLC			**InstantHMI Data Specification**		
Memory Type	**PLC Address (Dec)**	**Toshiba Function (Hex)**	**Data Format**	**InstantHMI Address (Dec)**	**Function**
0 Register D	xxxx	90		Xxxx	Read or write data registers.
1 Bit R	xxxx	80		Xxxx	Read or write status of relay coils.
2,3 Timer T	xxxx	b0		Xxxx	Read or write status of timers.
4,5 Counter C	xxxx	a0		Xxxx	Read or write status of counters.
8 XW	xxxx	50		Xxxx	Read ON/OFF Status of discrete inputs.
9 YW	xxxx	60		Xxxx	Read ON/OFF Status of discrete outputs.

Addressing Example: Accessing X and Y Bits on the Toshiba EX100

Step 1: Setup

Assume the following setup for Toshiba EX100 programmable controller.



a) The input module would be address XW 00.
b) The output module would be address YW 01.
Note that Modules are addressed in the order in which they are placed in the rack.

Step 2: Using Data Format Bit
Enter address of module 0 in this case and when asked to enter bit # enter 0-15 for Inputs 0-F and enter 0-11 for outputs 0-B.

Step 3: Using Memtype XW or YW
Choose XW for Inputs, YW for Outputs.

Note: Looking at XW and YW as integers Ignore Bit # entry and choose Integer for data Format.

Toshiba Computer Link Protocol-Driver 41

Toshiba T-Series Programmable Controller

If you are using a Toshiba Prosec T-Series Programmable Controller, carefully follow the installation instructions in the appropriate Toshiba Manual.

Introduction

InstantHMI allows you to use your hardware runtime platform - Windows PC, Windows CE or PDA (Pocket PC, Palm) device - to communicate with controllers from various manufacturers. This communication may take place using:

A serial cable link to a serial comm port on your controller.
An RF link to an RF access point on the controller.
A TCP/IP link to a TCP/IP compatible controller.
An infrared link to an infrared port on the controller.

If your controller does not support Wireless RF communications (WiFi or Bluetooth) you may be able to use the RF-Kit from Software Horizons to convert the serial port on your controller to a Wireless RF connection. Similarly, if your controller does not have a built-in IR port, you may be able to use the IR-Kit from Software Horizons to convert the serial port on your controller to an IR port.

Communication Protocol – Driver 41

The communication link is used to transfer information between the runtime platform and your controller according to the Toshiba Computer Link Protocol with checksum error checking. Please note that you must have the proper runtime engine installed on the target platform, and you must Register / Activate (see Appendix A in the InstantHMI manual) your InstantHMI software installation to communicate with your controller.

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Setting up your PLC for Proper Communications

For the T-Series Controllers, InstantHMI uses Toshiba T-Series Computer Link Protocol with a default communication setting of 9600 baud, Odd Parity, 8 data bits, 1 stop bit.

With some Toshiba controllers, the Station Number is configurable via PLC configuration software (factory default is 1).

You may choose a lower/higher baud rate, or different Station Number if desired; make sure the InstantHMI Data Source reflects any changes you make. Please see Section 3.10 of the InstantHMI Manual for more information on how to configure data sources.

If you are using a Stand-alone PDA version of InstantHMI (no LaunchPad), your data source can be edited by tapping Setup -> Comm Setup from the InstantHMI Main Menu on your handheld. Reference Section 9.2.1 in the InstantHMI Manual for more information.

Communication Protocol

The following functions are implemented in the standard release of InstantHMI Toshiba T-Series driver. If you need any additional functionality please contact Software Horizons.

Toshiba T-Series		**InstantHMI Data Specification**		
Memory Type	**PLC Address (Dec)**	**Memory Type**	**InstantHMI Address (Dec)**	**Remarks**
D	xxxx	Register	Xxxx	Read or write registers.
R	xxxx	Bit	Xxxx	Read or write bits.
T	xxxx	Timer	Xxxx	Read current timer.
C	xxxx	Counter	Xxxx	Read current counter.
X	xxxx	Digital Input	Xxxx	Read input
Y	xxxx	Digital Output	Xxxx	Read or write output

Examples

Toshiba T-Series		**InstantHMI Data Specification**			
Memory Type	**PLC Address**	**Memory Type**	**InstantHMI Address**	**InstantHMI Bit #**	**Remarks**
D	D10	Register	10	0	Read or write registers.
R	R002A	Bit	2	10	Read or write bits.
T	T5	CTimer	5	0	Read current timer.
C	C1	CCounter	1	0	Read current counter.
X	X0001	Digital Input	0	1	Read input
Y	Y0012	Digital Output	1	2	Read or write output

Note: For X, Y, and R Memory Types, the InstantHMI Address refers to the XW, YW, and RW register addresses. The InstantHMI Bit Number refers to a bit from 0-15 in that register.

Note: Configuring Serial to Ethernet WiFi Kit

When using a Serial to Ethernet WiFi kit from Software Horizons, the Serial to Ethernet Converter should have its **Flow** setting to **RTS/CTS** for proper communications. See Figure D.41.6 for an example of a valid configuration.

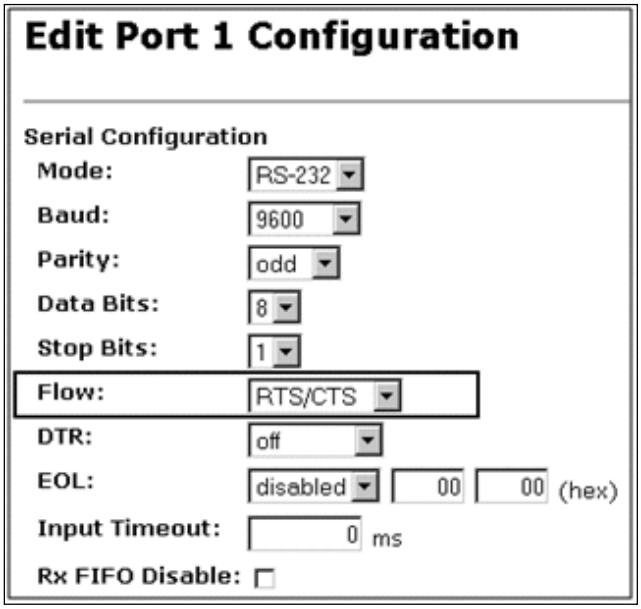

Figure D-42: Sample Serial to Ethernet Configuration

Toshiba Modbus TCP Communication Protocol-Driver 53

The communication link is used to transfer information between the runtime platform and your controller according to Modbus TCP protocol. The functions implemented in the standard release of InstantHMI Driver 53 (Modbus TCP) are listed in are listed in the table below.

Addressing (Memory Mapping)

InstantHMI implements the Modbus protocol using the RTU/ASCII/TCP transmission modes. The Table below illustrates the functions implemented in the standard release of InstantHMI Modbus driver along with example addresses. If you need any additional functions please contact Software Horizons.

Modbus Compatible Device			InstantHMI Data Specification		
Memory Type	**PLC Address**	**Function**	**Memory Type**	**InstantHMI Address**	**Function**
Internal Holding Register or Physical Output Register	4xxxxx	03	Register or Analog Output	xxxxx	Read Modbus Memory Type
Internal Register or Physical Output Register	4xxxxx	06	Register or Analog Output	xxxxx	Write Modbus Memory Type
Internal Bit or Physical Coil	0xxxxx	01	Bit or Digital Output	xxxxx	Read Modbus Memory Type
Internal Bit or Physical Coil	0xxxxx	05	Bit or Digital Output	xxxxx	Write Modbus Memory Type
Physical Discrete Input	1xxxxx	02	Digital Input	xxxxx	Read Modbus Memory Type
Physical Input Register	3xxxxx	04	Analog Input	xxxxx	Read Modbus Memory Type

Toshiba V200 Series Mapping

The following mapping already exists in the OIS PLUS/V200 PLC's internal memory. Simply create the same tags in InstantHMI (the Modbus master/Modbus Ethernet client).

Toshiba's Modbus Slave Mapping: OIS45E PLUS, OIS70E PLUS, OIS120A & V200 PLCs						
No.	**Register / Coil**	**Abv.**	**Tag Length***	**Range**	**Modbus Mapping**	**InstantHMI Mapping****
1	Timer Register (R/W)	T	2 Bytes	0000-0255	400001 - 400256	00001 - 00256
2	Counter Register (R/W)	C	2 Bytes	0000-0255	410001 - 410256	10001 - 10256
3	System Register (R/W)	SW	2 Bytes	0000-0255	420001 - 420256	20001 - 20256
4	Retentive Register (R/W)	R	2 Bytes	0000-1399	430001 - 431400	30001 - 31400
5	Input Register (R)	XW	2 Bytes	0000-0399	440001 - 440400	40001 - 40400
6	Output Register (R/W)	YW	2 Bytes	0000-0399	441001 - 441400	41001 - 41400
7	Internal Register (R/W)	BW	2 Bytes	0000-0255	442001 - 442256	42001 - 42256
8	Index Registers	I/J/K	2 Bytes	0000-0002	443001- 443003	43001 - 43003
9	Configuration Register	MW	2 Bytes	0000-1599	460001 - 461600	60001 - 61600
10	Data Register (R/W)	D	2 Bytes	0000-4095	450001 - 454096	50001 - 54096
11	Input Coil (R)	X	1 Bit	0000-6399	000001 - 006400	00001 - 06400
12	Output Coil (R/W)	Y	1 Bit	0000-6399	010001 - 016400	10001 - 16400
13	System Coil (R/W)	S	1 Bit	0000-0099	020001 - 020100	20001 - 20100
14	Internal Coil (R/W)	B	1 Bit	0000-4095	030001 - 034096	30001 - 34096
15	Timer Coil(R/W)	T.xxxx	1 Bit	0000-0255	021001-021256	21001-21256
16	Counter Coil(R/W)	C.xxxx	1 Bit	0000-0255	022001-022256	22001-22256
17	Configuration Coil(R/W)	M	1 Bit	00000-25599	035001- 060600	35001- 60600

* Modbus register/coil tag length is the same as Register/Bit tag length in InstantHMI.
** Choose Base Address = 1 in Driver options to match the Toshiba PLC Range

Note: While defining the Data Source for your controller, you may click on the 'Properties' button to change the default parameters we have selected for the 'Driver Options' for the modbus controller. If your controller differs from the standard modbus PLC, you may change the Driver Options to suit your controller. For example, you may select the base address (for registers) to be Zero or One to ensure that the addressing suggested above matches your PLC. In addition, Word Ordering (Byte swapping) may be selected to match the scheme for your controller. Some controllers support the Daniel 32-Bit extensions to the standard Modbus protocol to be used with Floating point values in the controller. The best way to define the Data Source for your controller is setup a test screen with relevant input and monitor fields, use the default setup for 'Driver Options' and verify if the result for your controller is what you expect. If not, make the necessary adjustments in the 'Driver Options' dialog and re-test to ensure that your test screen produces the expected results.

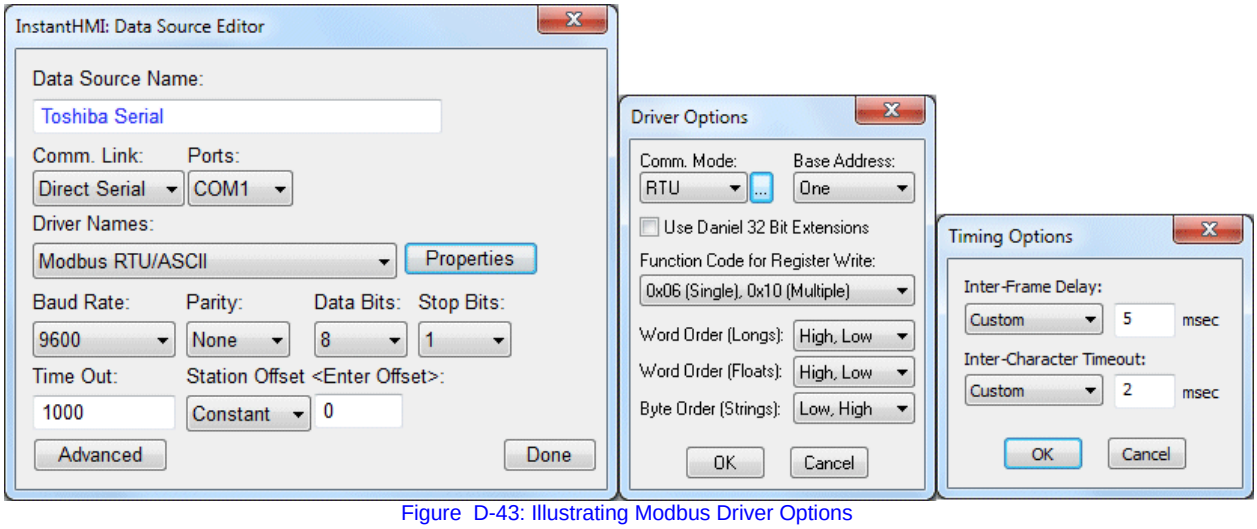

Figure D-43: Illustrating Modbus Driver Options

SOFTWARE HORIZONS INC.®
simplify

100 Treble Cove Road
N. Billerica, MA 01862
USA
Tel: 978-670-8700